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SWATERRESOURCES ABSTRACTS



VOLUME 8, NUMBER 2 JANUARY 15, 1975 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED

WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 8, NUMBER 2 JANUARY 15, 1975

W75-00551 -- W75-01100

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

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01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities: Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

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SUBJECT INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A WATER BALANCE ON A SMALL AGRICUL-TURAL WATERSHED, LATAH COUNTY, IDAHO.

Idaho Univ., Moscow. Dept. of Agricultural En-

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PB-236 944, \$4.75 in paper copy, \$2.25 in microfiche. M Sc Thesis, October 1971. 88 p, 8 fig, 4 tab, 33 ref, 4 append. OWRT A-029-IDA(4).

*Water *Idaho. Evapotranspiration, *Agricultural watersheds, Deep percolation, Correlation analysis, Precipitation (Atmospheric), Soil moisture, Regression analysis. Water resources, Hydrologic cycle, Surface waters, Watersheds(Basins), Ru-

off, Agroclimatology.

Identifiers: *Thompson Watershed(ID), *Crop coefficients, *Crop stress, Water balance equation, Penman method, Jensen-Haise method, Evapotranspiration component, Hydrologic components, Soil moisture storage.

A water balance study was made during the water year 1970-71 on the Thompson watershed near Moscow, Idaho. All hydrologic factors except deep percolation were measured. Several methods were used to measure evapotranspiration. Neutron probes monitored changes in soil moisture storage. Analysis of the data showed that of the total precipitation falling on the watershed 27% went to runoff, 57% to evapotranspiration, and 16% to deep percolation. These values are similar to those of previous studies. Relative accuracies for the components of the water balance equation, expressed as a percentage of the total precipitation, were determined. It was found that components of were determined. It was found that components of precipitation and deep percolation could each have an error as great as 10%, and that the components of surface discharge and evapotranspiration would each have a probable error of less than 3%. Several methods for calculating evapotranspiration using climatic parameters were compared with evapotranspiration determined from measurements of changes in soil moisture storage. surements of changes in soil moisture storage. (Roberts-ISWS) W75-00552

FLOOD HYDROGRAPH SYNTHESIS FOR RURAL PENNSYLVANIA WATERSHEDS, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. B. H. Lee, B. M. Reich, T. M. Rachford, and G.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 937, son service, springited, va. 2/161 as PB-236 937, S5.25 in paper copy, \$2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Completion Report, June, 1974. 94 p. 29 fig, 11 tab, 19 ref. OWRT B-041-PA(4). 14-31-0001-3635.

*Floods, *Unit hydrographs, Descriptors: *Pennsylvania, *Design Storm, Synthetic hydrology, Rural areas, *Rainfall-runoff relationships, Flow, Runoff, Equations, Storm runoff, Watersheds(Basins). Identifiers: *Runoff Equation.

A method is presented for developing design hydrographs for ungaged rural watersheds ranging in size from 3 through 173 square miles. It uses the peak predicted by regional flood frequency as a starting point. Newly developed design storms for Pennsylvania and environs are employed to obtain a sequence of rainfall excesses. A theoretically derived rainfall-runoff relationship replaces the classical Soil Conservation Service 'P-Q' relation-

ship, or uniform loss-rate approach. The synthetic unit hydrograph is modeled by a high quick-flow triangle superimposed on a flatter longer triangle of delayed flow. The rise time of the latter equals the base length of the former. Combined these the double trangular unit hydrograph with four parameters specifying its shape. Each of these can be predicted from watershed and storm variables. Four hydrologic soil groups combined with the major land use dichotomy of forested versus nonforested are used to determine incremental runoff volumes. Runoff response is also tempered by ini-tial watershed wetness which is rated according to an antecedent moisture index.

STOCHASTIC MODEL FOR A DYNAMIC ECOSYSTEM, Virginia Polytechnic Inst. and State Univ., Blacksburg Dept. of Statistics. For primary bibliographic entry see Field 5B. W75-00559

STOCHASTIC GENERATION OF THE OCCUR-RENCE, PATTERN, AND LOCATION OF MAX-IMUM AMOUNT OF DAILY RAINFALL, Agricultural Research Service, Chickasha, Okla. For primary bibliographic entry see Field 2B. W75-00595

SUMMARY OF PLANS FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1975. Geological Survey, Reston, Va. Office of Water

Data Coordination.

For primary bibliographic entry see Field 7A. W75-00617

RAINFALL AND RUNOFF IN URBAN AREAS--A CASE STUDY OF FLOODING IN THE PIED-MONT OF NORTH CAROLINA, Geological Survey, Raleigh, N.C.

A. L. Putnam.

In: Short Papers of the Eighth American Water Resources Conference, St. Louis, Missouri, Oc-tober 30-November 2, 1972: American Water Resources Association Proceedings Series No 16,

Descriptors: *Urban hydrology, *North Carolina, *Rainfall-runoff relationships, Urban runoff, Storm runoff, Hydrographs, Time lag, Peak discharge, Floods, Cities, Urbanization.
Identifiers: *Durham(NC), *Lenior(NC), Winston-Salem(NC).

Several cities in Piedmont North Carolina--Charlotte, Durham, Lenior, Morganton, and Winston-Salem--entered into cooperative projects with U. S. Geological Survey to determine a reliable and usable method for predicting flooding on ungaged streams in the region. The Geological Survey studied 34 urban watersheds ranging in size from 0.27 to 178 square miles and in impervious cover from less than 1% to 32%. These watersheds were equipped with instruments to record rainfall in synchronization with the resultant runoff. Information on physical characteristics of the watershed was also collected. This included the drainage area, length of the main watercourse, channel slope of the main watercourse, and the percent of the drainage area covered with impervious materials. The most striking changes are those associated with the time required for streamflow to respond to rainfall and the increase in the magnitude of discharge for floods of relatively short recurrence intervals. Urban development can reduce the average basin lag time to as little as one-fourteenth of its value for natural conditions. The effect of this reduction in lag time is to hasten the bulk of storm water past a point on the stream.

Coupled with this effect is the increase in the volume of water that becomes runoff during a

given rain. The combined effect is to increase the magnitude of flood discharge. A 5-year flood discharge for a watershed with development associated with 25% impervious cover is approximately equal to a 40-year flood discharge for the same watershed with natural drainage conditions. (Knapp-USGS) W75-00638

A COMPARISON OF OVERLAND FLOW MODELS, Colorado State Univ., Fort Collins. Dept. of Civil COMPARISON OF OVERLAND FLOW

Engineering.
E. F. Schulz, and P. E. Fawkes.
Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 707, \$3.75 in paper copy, \$2.25 in microfiche. Civil Engineering Paper 72-73EFS-PEF26, Presented at 1972 Fall Annual Meeting, American Geophysical Union, San Francisco, California Dec 4-7, 1972. 25 p, 15 fig. 1 tab, 20 ref. OWRT B-064-COLO(9). 14-31-0001-3565.

Descriptors: *Demonstration watersheds, *Surface runoff, *Hydraulic models, *Mathematical models, Hydrology, Model studies, Overland flow, Laminar flow, Turbulent flow, Transition flow, Reynolds Number, Flow resistance, Friction, Hydrographs, Laboratory tests, Painfall, runoff relevingshire. Rainfall-runoff relationships.
Identifiers: *Kinematic wave equations, Rosen-

brock optimization technique.

A three and four parameter model of overland flow based on kinematic wave approximations was developed. The parameters in the model were evaluated with observed data from the Colorado evaluated with observed untail from the Colorador State University Experimental Rainfall Runoff Facility. Optimum values of the parameters were obtained using a version of the Rosenbrock op-timization technique. The watershed surface was graded to a uniform slope and covered with a sheet of butyl rubber. In order to increase the volume of detention storage, the surface was roughened by scattering 1.5-inch gravel on the surface. The watershed consisted of a conic sector with a radius of 116 feet, an internal angle of approximately 104.5 degrees, and a slope of 5%. The results demonstrated that distinct laminar, disturbed laminar, turbulent and disturbed turbulent flow regimes could be recognized. The three parameter regimes could be recognized. The three parameter model had a friction parameter for laminar flow and a laminar-turbulent transition Reynolds Number. The four parameter model had a friction parameter, a resistance parameter, a Darcy Weisbach friction factor during rainfall, and a weisbach include transition Reynolds Number.
The experimental results did not clearly demonstrate the superiority of either model.
(Humphreys-ISWS)
W75-00704

GROUND-WATER MODELLING USING IN-TERACTIVE ANALOGUE AND DIGITAL COM-

Birmingham Univ. (England). Dept. of Civil Engineering. For primary bibliographic entry see Field 2F. W75-00747

THE DEVELOPMENT OF HYDROLOGICAL CONCEPTS IN BRITAIN AND IRELAND BETWEEN 1674 AND 1874, University Coll., Dublin (Ireland). Dept. of Civil

Engineering. J. C. I. Dooge. Hydrological Sciences Bulletin, Vol 19, No 3, p 279-302, September 1974. 3 tab. 37 ref.

Descriptors: *Hydrology, *History, *Reviews, Evolution, Water balance, Hydrologic cycle, Evaporation, Runoff, Precipitation(Atmospheric), Springs, Rainfall, Meteorology, Water balance, Rational formula, Time of concentration. Identifiers: *United Kingdom.

Group 2A-General

Two hundred years (1674-1874) of historical evolution of major hydrological concepts were discussed with concentration on only a few individuals and events rather than a connected historical narrative. The work of three men span this period: Edmond Halley (1665-1742); John Dalton (1766-1844); and Thomas Mulvany (1821-1892). Halley (for whom the Comet was named) is best remembered for his paper on evaporation and the hydrologic cycle. Several direct quotes traced Halley's experiments with small pan evaporation, his estimates of inflow to the Mediterranean Sea, and his conclusion that two-thirds of this inflow was lost through evaporation. Halley then outlined what later became the hydrologic cycle, including transpiration and orographic effects. John Dalton presented early meteorological opinions including his theory on both evaporation and the reasons for various forms of precipitation. He made estimates of regional rainfall and runoff and calculated the annual water balance for England and Wales. Thomas Mulvany was credited with the concept of time of concentration, which is central to the ra-tional method of estimating peak flood discharge. He used measured rainfall rates and catchment characteristics, and recognized the effect of human activity on the hydrologic cycle. (Roberts-W75-00754

SOME ASPECTS OF THE ARABIAN SEA SUMMER MONSOON,

Institute of Tropical Meteorology, Poona (India). For primary bibliographic entry see Field 2B. W75-00755

A HEAT-BALANCE STUDY ON MCCALL GLACIER, BROOKS RANGE, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,

Alaska Univ. College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-00769

GROUND WATER COMPUTATIONS IN NEW

JERSEY, U.S.A., Columbia Univ., New York. G. J. Halasi-Kun.

Nordic Hydrology, Vol 5, No 2, p 108-118, 1974. 1 fig. 2 tab. 13 ref.

Descriptors: *Groundwater availability, *Aquifers, *Surface runoff, *Rainfall intensity, *Well data, *New Jersey, Water wells, Groundwater recharge, Evapotranspiration, Storage capacity, Permeability, Watersheds(Basins), Groundwater resources, Hydrogeology, On-site investigations, Sedimentary rocks, Flow, Flood

Identifiers: *West Germany, *Czechoslovakia.

Results of studies conducted in Czechoslovakia, West Germany, and New Jersey showing that in rural areas the 100-year flood of small watersheds has a strong dependence on the permeability of the geologic subsurface of the watershed and on the point rainfall intensity were briefly summarized. Based on 70,000 well record files in New Jersey, the groundwater availability in the rock formations was examined. (Schicht-ISWS) W75-00784

THE EFFECT OF SURFACE DRAINAGE ON

WATER TABLE RESPONSE TO RAINFALL.
North Carolina State Univ., Raleigh. Dept. of
Biological and Agricultural Engineering; and
North Carolina State Univ., Raleigh. Dept. of Soil

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 406-411, May-June 1974. 9 fig, 4 tab, 15 ref.

Descriptors: *Surface-groundwater relationships, *Water table, *Water level fluctuations, *Surface

drainage, *Forecasting, Numerical analysis, Rainfall, Groundwater, Water management(Applied), Depression storage, Aquifers, Subsurface drainage, On-site tests, *North Carolina, Humid

Identifiers: *Lumbee sandy loam soil.

A numerical method for predicting the water table response to rainfall and for evaluating the effect of surface depression storage on that response was presented. The method can be used to predict the water table response subject to any combination of the following conditions: ponded surface, variable rainfall intensity, nonuniform initial water content, variable initial water table depths, drainage with any depth and spacing of drains, evapotranspiration at the surface, any amount of surface depression storage. In its present form the method cannot be used for evaluating the effect of surface detention storage. Based on the results of a study on a Lumbee sandy soil it was concluded that the proposed method can be used to evaluate the ef-fect of surface drainage on the water table response to rainfall if the surface drainage can be characterized in terms of depression storage. In characterized in terms of depression storage. In addition to the boundary and initial conditions, required inputs to the method include the soil water characteristic and the hydraulic conductivity function. The method is sufficiently accurate for use in simulating long term water table fluctuations for various surface and subsurface drainage systems with the ultimate objective of drainage systems design on a probabilistic (Humphreys-ISWS) W75-00786

THE RELATION OF RAINFALL NETWORK DENSITY TO ACCURACY OF RUNOFF PRE-DICTION IN A MOUNTAINOUS BASIN, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 7A. W75-00807

THE ROLE OF SNOW AND ICE IN HYDROLO-GY. For primary bibliographic entry see Field 2C. W75-00809

SNOWPACK CALIBRATION ON MARMOT CREEK TO DETECT CHANGES IN ACCUMU-LATION PATTERN AFTER FOREST-COVER MANIPULATION, Northern Forest Research Center, Edmonton

For primary bibliographic entry see Field 7B. W75-00817

THEORY OF RADIATION HEAT TRANSFER BETWEEN FOREST CANOPY AND SNOW-

Arizona Univ., Tucson. Coll. of Agriculture. C. F. Bohren.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 165-175, 1973. 3 fig. 15 ref.

Descriptors: *Snowpacks, *Forests, *Solar radiation, *Canopy, *Energy budget, Snowmelt, Water yield.

The equations of radiative transfer were applied to The equations of radiative transfer were applied to a forest canopy that transmits radiation to an underlying snowpack. Both long wave and solar fluxes incident on the snowpack were calculated for a model canopy represented by a homogeneous slab. Scattering of solar radiation was not accounted for although the methods can be extended to the case of a canopy that scatters as well as absorbs solar radiation and receives reflected radiation from an underlying snowpack. The theory tion from an underlying snowpack. The theory predicts that the total surface area of vegetation in the canopy is the relevant canopy parameter that determines the amount of radiation energy incident on a snowpack. (See also W75-00809) (Knapp-USGS) W75-00821

SPATIAL AND TEMPORAL VARIATIONS OF THE ALBEDO OF PRAIRIE SNOWPACK, Saskatchewan Univ. (Saskatoon). Coll. of Engineering. For primary bibliographic entry see Field 2C. W75-00822

PRELIMINARY STUDY OF THE THERMAL BALANCE OF THE AMPERE GLACIER, KER-GUELEN (BILAN THERMIQUE DU GLACIER KERGUELEN AMPERE PRELIMINAIRE),

Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie. For primary bibliographic entry see Field 2C W75-00823

SOLAR RADIATION PENETRATION THROUGH SNOW, Saskatchewan Univ., Saskatoon. Coll. of Engineering. For primary bibliographic entry see Field 2C. W75-00825

A DIMENSIONAL ANALYSIS OF HEAT AND MASS TRANSFER IN A SNOWPACK, Saskatchewan Univ., Saskatoon.

D. H. Male, D. I. Norum, and R. W. Besant. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 258-290, 1973. 1 tab, 6 ref, append.

Descriptors: *Snowpacks, *Heat transfer, *Mass transfer, *Snowmelt, *Dimensional analysis, Energy budget, Melting, Snow cover, Convection, Conduction, Solar radiation.

Radiant, convective and conductive heat fluxes in the interior of snowpacks, the rates of phase change, and the movement of meltwater and water vapor were studied using dimensional analysis. In addition the energy and continuity equations at the snow-air interface and the dimensionless groups governing the fluxes of energy and mass at this boundary were determined. The number of dimensionless parameters governing the heat and mass transfer in the snowpack is such that the develop-ment of general analytical, numerical, or experimental models will prove impractical. It is suggested that field studies of situation involving a restricted number of parameters is the only tractable approach. (See also W75-00809) (Knapp-USGS) W75-00827

MOVEMENT OF WATER THROUGH SNOW PACK TRACED BY DEUTERIUM AND TRITI-

Iceland Univ. Reykjavik Science Inst. For primary bibliographic entry see Field 2C. W75-00829

GROUND CONDITIONING AND THE GROUNDWATER RESPONSE TO SURFACE

Department of the Environme (Ontario), Water Resources Branch. of the Environment, Ottawa R. L. Harlan.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 326-341, 1973. 5

Descriptors: *Frozen ground, *Soil water move-ment, *Groundwater movement, Surface-ground-water relationships, Mathematical models, Porous media, Convection, Mass transfer, Heat transfer.

By using an analogy between water movement in unsaturated soil and in partly frozen soil, a Dar-cian approach is applied to the analysis of simul-taneous heat-fluid transport in frozen porous media. A mathematical model describing flow of a single fluid and convective and conductive heat transport in the presence of freezing and thawing is presented and solved numerically by finite differences. Soil-water redistribution and the response of the groundwater table to subfreezing soil temperatures and subsequent warming are examined from a phenomenological point of view. The effects of soil properties and the initial position of the groundwater table on the response of a hypothetical soil profile are also discussed. (See also W75-00809) (Knapp-USGS) W75-00831

HYDROLOGY OF A PARTLY GLACIER-COVERED ARCTIC WATERSHED,

COVERED ARCTIC WATERSHED,
Alaska Univ., College.
G. Wendler, D. Trabant, and C. Benson.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 1, p 417-434, 1973. 8
fig. 4 tab, 30 ref. NSF Grants GA-10090 and GA227284

Descriptors: *Glaciohydrology, *Water balance, *Glaciers, *Alaska, Precipitation(Atmospheric), Ablation, Runoff, Melting, Data collections, Hydrologic data. Identifiers: *Brooks Range(Alas).

Some of the hydrological characteristics of a 30% glacier-covered Arctic watershed and the com-bined water and ice balance for two periods in the summers of 1969 and 1970 are compared. Each study period represents about 50% of the total ru-noff-ablation season. The watershed is on the northern slopes of the Brooks Range in Alaska. northern slopes of the Brooks Range in Alaska. The snow and ice ablation calculated by direct measurements produced values about 16% lower than by calculating the water balance. Possible reasons for this discrepancy are insufficient knowledge of the distribution of precipitation; insufficient number of ablation stakes; changes in the louid the stream cross-section; and changes in the liquid water content within the basin. (See also W75-00809) (Knapp-USGS)

RADIATION AND HEAT BALANCES, THER-MAL REGIME OF AN ICING, Akademiya Nauk SSSR, Novosibirsk

MAL BESTANDARY NAME SSSR, Novosibirsk.

M. K. Gavrilova.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, Septbmer 1972:

The Role of Snow and Ice in Hydrological Association of Hydrological Associat International Association of Hydrological Sciences Publication 107, Vol 1, p 496-504, 1973. 4

Descriptors: *Ice, *Heat budget, *Freezing, Solar radiation, Alluvial channels, Frost. Identifiers: *Icings, *Naleds, *USSR(Ulakhan-Tarvn valley).

Radiation and heat balances, as well as thermal regime of an icing were studied using data ob-tained from three years' observations in the Ulakhan-Taryn valley, Central Yakutia, USSR. The radiation balance of the icing valley is only 65% of the annual value for the vicinity. This is explained by the lack of incoming solar radiation due to clou-diness and by considerable heat losses caused by anness and by considerable near losses caused by radiation outgoing from the icing surface. In winter, a powerful heat source is generated in the valley by heat given back by melt water and heat released when water freezes. The amount of heat produced during the formation of icing is con-

sistent with the annual total of radiation balance (17-20 kcal/sq cm). In spring and during the first half of summer, the same amount of heat is required for melting of the icing, which may be 2-3 m thick. The lack of radiation heat is compensated for by the heat flow from the atmosphere (40-55%). With the disappearance of icings, most of the thermal energy is used for evaporation and heating of soil. Icing exerts great influence on the underlying ground as it is a heat generator. Soil freezes little in the Ulakhan-Taryn valley. (See also W75-00809) (Knapp-USGS) W75-00843

SEASONAL REGINE AND HYDROLOGICAL SIGNIFICANCE OF STREAM ICINGS IN CEN-

TRAL ALASKA, Alaska Univ., College Inst. of Water Resources. For primary bibliographic entry see Field 2C. W75-00846

ICING MOUNDS AS A FACTOR OF FORMA-TION OF RIVER AND UNDERGROUND RU-NOFF IN EASTERN SIBERIA, Akademiya Nauk SSSR, Novosibirsk. Inst. of

Cryology.
O. N. Tolstikhin, and B. L. Sokolov.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 557-563, 1973

Descriptors: *Ice, *Surface-groundwater relationships, *Alluvial channels, Groundwater, Freezing, Melting, Water supply, Streamflow, Ice cover. Identifiers: *Icings, *Naleds, *USSR(Siberia).

Icing formation and distribution in eastern Siberia are described. Methods are given for computation of icing formation and flow, and the infouence of the icing process on the formation of surface and groundwater resources is discussed. The hydrological role of the icing process lies in its redistribu-tion of groundwater component of river runoff during the annual cycle from cold season to warm.

In the winter period river runoff does not characterize the total underground runoff of the basin, terize the total underground runort of the basin, being less by the volume of groundwater that forms icings. In the warm period of the year the melt water of icings adds to the surface and groundwater components of river runoff. In the warm season the influence of icings is most significant during spring flood. Additional inflow into the channel network in the headwaters of Jana, Indigirka, and Kolyma Piwers after the melting of digirka, and Kolyma Rivers after the melting of icings reaches 20%-40%, and, in some cases, 60%-80% of the total amount of spring flood runoff. At the initial stage of spring flood the share of icing runoff may be 80%-90% of river runoff. In eastern Siberia icings constitute about 37% of total groundwater resources. In some river basins, situated within hydrogeological regions with favorable conditions for icing formation, more than 40%-80% of annual underground flow is expended on icing formation. (See also W75-00809) (Knappicing fo W75-00849

COMBINED SOLUTION OF WATER BALANCE EQUATIONS OF THE ATMOSPHERE AND RIVER BASINS FOR DEFINITION OF WATER EQUIVALENT OF SNOW PACK AND TOTAL Akademiya Nauk SSSR, Moscow. Institut Vod-nykh Problem.

nykh Problem.

G. P. Kalinin, and L. P. Kyznetzova.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 762-771, 1973. 2 fig, 3 tab, 13 ref.

Descriptors: *Water balance, *Climatic data, *Meteorological data, Snowpacks, Data collec-tions, Rainfall, Runoff. Identifiers: *USSR(Siberia).

The water vapor balance in the atmosphere over the territory of the USSR and western Siberia was calculated from aerological data for an 8-year period. Results make it possible to locate with greater accuracy regions of atmospheric water vapor inflow and outflow and to obtain independently the values of total runoff to the ocean and of moisture accumulation during winter months. The calculated values are in good agreement with surface hydrometeorological data. (See also W75-00809) (Knapp-USGS)

TWO-YEAR CYCLES IN SOIL MOISTURE RECHARGE, SNOWPACK, AND STREAM-FLOW IN RELATION TO ATMOSPHERIC CONDITIONS, (WITH SPECIAL REFERENCE TO THE UPPER COLORADO RIVER BASIN), Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.

G. B. Engelen.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 895-914, 1973. 13 fig. 12 ref.

Descriptors: *Soil moisture, *Snowpacks, *Streamflow, *Colorado River basin, Synoptic analysis, Water balance, Runoff forecasting, Streamflow forecasting, Statistics.

Mean regional values of soil moisture, snowpack, and streamflow for the mountain area roughly coinciding with the Upper Colorado River basin and the regional atmosphere show a cyclic alternation of high and low values in consecutive periods. A conceptual model is presented to explain the two-year cycles by relating the regional hydrologi-cal subsystems of the Upper Colorado River basin with each other and with the major atmospheric circulation over the western United States. Deviations from the regional cyclical behavior are explained by shifts and trends in the major at-mospheric circulation patterns. (See also W75-00809) (Knapp-USGS) W75-00876

MODELLING SNOWMELT RUNOFF IN AN ARCTIC COASTAL BASIN, Alaska Univ., College. Inst. of Water Resources.

R. Carlson, W. Norton, and R. Britch.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1004-1016, 1973.

Descriptors: *Snowmelt, *Arctic, *Coastal plains, *Alaska, *Runoff forecasting, Streamflow forecasting, Hydrographs, Mathematical models, Energy budget, Ice breakup.

A model was developed to simulate snowmelt-runoff on the arctic coastal plain of Alaska. The initial model simulation operates in two parts. The first is a snowmelt hydrograph generation program which uses a four component energy transfer computation to transform climatological information into snowmelt. The second part uses a two-parameter linear storage model to transform the snowmelt hydrograph into the runoff hydrograph. A test run using 1971 data for the Putuligayuk River basin indicates that the model performs satisfactorily. Model development will include a delay factor in the snowmelt process, further delineation of the surface and channel storage, and provision for channel delay. (See also W75-00809) (Knapp-USGS) tial model simulation operates in two parts. The

DAILY AND SEASONAL RUNOFF FORECAST-ING WITH A WATER BUDGET MODEL, British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.

Group 2A-General

W75-00885

COMPUTER SIMULATION TECHNIQUES FOR FORECASTING SNOWMELT RUNOFF, Hydrocomp, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 4A. W75-00889

INFLUENCE OF AIR TEMPERATURE AND SOLAR RADIATION ON SNOWMELT RUNOFF FROM A SMALL WATERSHED, Ottawa Univ. (Ontario). Dept. of Civil Engineer-

For primary bibliographic entry see Field 2C. W75-00890

THE SIGNIFICANCE OF SNOW IN BRITAIN. Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W75-00893

RUNOFF FORECASTS FOR HIGHLY GLACIERIZED BASINS,

Norwegian Water Resources and Electricity Board, Oslo. Glaciology Section.

G. Ostrem.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1111-1132, 1973. 6 fig. 1 tab. 17 ref.

Descriptors: *Melt water, *Glaciohydrology, *Runoff forecasting, Streamflow forecasting, Ablation, Statistical models, Mathematical models, Data collections, Meteorological data. Identifiers: *Norway.

River runoff forecasts for glacierized basins are made in Norway using detailed mass balance studies and simultaneous runoff measurements.

Models that give reliable results 1-3 days in advance are used for short-term runoff forecasts. Good weather forecasts can extend this period. There are in principle two different methods presently in use or under development: a physical model based on known processes at the glacier surface, and a mathematical-statistical model based on actual observations of runoff and meteorological parameters. The problems of using past glacier oscillations, glacier surges, and palaeoclimatic data obtained from the Greenland ice sheet are also discussed. (See also W75-00809) (Knapp-USGS) W75-00894

A SURGE OF THE KOLKA GLACIER AND ITS HYDROMETEOROLOGICAL CON-

SEQUENCES, Akademiya Nauk SSSR, Moscow. Institut

For primary bibliographic entry see Field 2C. W75-00898

ATMOSPHERIC CIRCULATION FORECASTING OF DATES OF ICE FORMA-TION IN RIVERS, Hydrometeorological Service of the USSR,

For primary bibliographic entry see Field 2C.

COMPUTATION OF CRYSTAL AND SNOW ICE ACCRETION IN RESERVOIRS FROM METEOROLOGICAL DATA, Hydrometeorological Service of the USSR,

Moscow. For primary bibliographic entry see Field 2C. W75-00902 REGRESSION EQUATIONS RELATING ICE CONDITIONS IN THE UPPER NIAGARA RIVER TO METEOROLOGICAL VARIABLES, Atmospheric Environment Service, Downsview (Ontario). For primary bibliographic entry see Field 2C. W75-00911

AN EVALUATION AND APPLICATION OF A MODEL TO AN IDAHO WATERSHED,
Idaho Univ., Moscow. Dept. of Agricultural Engineering. R. S-C. Lee.

Available from the National Technical Informa-Avanable Home Headman Technical Information Service, Springfield, Va. 22161, as PB-237 153, 86.25 in paper copy, \$2.25 in microfiche. Master's Thesis. Idaho, July 1973. 159 p, 7 fig, 6 tab, 25 ref, 4 appen. OWRT A-029-IDA (7).

Descriptors: *Simulation analysis, *Hydrologic cycle, Digital computers, *Watersheds(Basins), *Idaho, *Computer models, Evaluation, Water yield, Runoff, Flow, Precipitation, Model studies, Daily hydrographs, River basins, Measurement, Hydrologic data, Mountains, Systems analysis. Identifiers: *Kentucky Watershed Model, Stanford Watershed Model

Watershed simulation models play an important role in the planning and management of water resource engineering projects. In this study, the Kentucky (FORTRAN) version of the Stanford Watershed model is adapted for use on the IBM 360/40 digital computer system available at the University of Idaho. First, watershed models already in existence are reviewed briefly. Then the Kentucky Watershed Model is described, along with changes and modifications made in order to adapt it to the University of Idaho's computer, which has limited storage capacity. The Idaho model was applied and evaluated on the Palouse River near Potlatch, a 317 square mile watershed in northern Idaho. Daily flows were synthesized and plotted against recorded flows for water years and pioted against recorded flows for water years 1967-1968 and 1969-1970. The synthesized annual water yield was found to be 7.34 and 13.59 inches respectively versus recorded values of 5.68 and 12.05 inches. A tendency to underestimate peaks early in the runoff season and to underestimate the spring recession was observed. An adjustment to the valley precipitation estimate was made to account for orographic influences on the amount of precipitation received in the upper mountainous region of the watershed. Results show that the model appears to reproduce the daily hydrograph within the accuracy of basic input data. Bell-Cornell) W75-00968

SURFACE RUNOFF SIMULATION MODEL, Nebraska Univ., Lincoln. Dept. of Civil Engineer-

ing. I. Yomtovian.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-237
159, \$5.25 in paper copy, \$2.25 in microfiche.
Master's Thesis. The Graduate College in the
University of Nebraska, Lincoln, Nebraska, Department of Civil Engineering, September 1973. 99
p, 36 fig, 5 tab, 33 ref, 1 append. OWRT A-021-

Descriptors: *Simulation analysis. *Hydrologic Descriptors: "simulation analysis, "Hydrologic systems, "Computer programs, "Rainfall-runoff relationships, "Surface runoff, Reservoirs, Hydrographs, Behavior, Synthetic hydrology, Storms, "Nebraska, Hydrologic cycle, Surface waters, Water management(Applied), Computer models, Equations, Systems analysis, Ponds. Identifiers: Prediction, Depressed areas, Loss function, Historical data.

In analyzing large and complex hydrologic systems, data costs, mathematical limitations and the complexity of description are good reasons for

considering the use of simulation techniques. This study emphasizes the surface water aspect of the hydrologic cycle. Presented is a rainfall-runoff model designed to produce a complete runoff hydrograph. The model can be used to predict the future behavior of a hydrologic system. Historical data have been used for verification. This model is represented by a Fortran IV program consisting of a main program, subprogram and subroutine. The main program includes six blocks: effective rainfall, unit hydrograph, composite hydrograph, channel-routing, reservoir routine and storage block. The program is controlled by a controller parameter which guides the input data through different blocks of the main program. Subroutine (PRITE) is used to provide different levels of output information which can be printed or punched. Subprogram (PLOT) is used to plot the output from the main program (simulated hydrograph). It is possible to plot gross rainfall, and the actual and simulated hydrographs on a single plot. A complete listing of the program appears in Appendix I along with a description of data input and data card order for the Eagle Drainage Area. (Bell-W75-00969

2B. Precipitation

STOCHASTIC GENERATION OF THE OCCUR-RENCE, PATTERN, AND LOCATION OF MAXIMUM AMOUNT OF DAILY RAINFALL. Agricultural Research Service, Chickasha, Okla.

A.D. Nicks.
In: Proceedings Symposium on Statistical Hydrology, USDA Miscellaneous Publication No. 1275, p 154-171, June 1974, 9 fig, 10 tab, 12 ref.

*Rainfall, *Model *Stochastic processes, Synthetic hydrology, Distribution patterns, *Oklahoma, Data collections. Identifiers: Rainfall frequency, Statistical models, Monte Carlo method.

A four-stage stochastic generation technique is used to synthesize the daily rainfall for a 1,500-square-mile area in central Oklahoma. Synthetic records of up to 9 years are generated at 168 locations of an existing rain gage network. Spatial pat-terns of rainfall for input to a hydrologic model are constructed by stochastically generating: (1) The occurrence or nonoccurrence of rainfall on each day, (2) the location of the central or maximum amount within the area, (3) the maximum amount, and (4) the pattern rainfall over the 1,500-squaremile area corresponding to the central amount. Tests are presented for the representativeness and consistency of generated data including means, extremes, and frequency of occurrence in both time and spatial distribution. (ARS) W75-00595

AN ANALYSIS OF DAILY PRECIPITATION PATTERNS IN AND AROUND THE NEW YORK CITY AREA AND THE POSSIBLE EFFECTS OF THE URBAN AREA ON THESE PATTERNS, Rutgers - The State Univ., New Brunswick, N.J. E. A. Brotak.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 077, \$4.75 in paper copy, \$2.25 in microfiche. M Sc Thesis, July 1972. 79 p, 7 fig, 23 tab, 40 ref. OWRT A-026-NJ, B-044-NJ(1). 14-31-0001-3615.

Descriptors: *Local precipitation, *Rainfall disposition, *Climatology, *Statistical models, *Meteorological data, New York, Precipitation(Atmospheric), Rain, Rainfall, Weather data, Frequency analysis, Probability, Markov processes, Rainfall disposition, Areal, Distribution patterns, Cities, Temporal distribution. Identifiers: *New York City.

Various analyses were performed on daily precipitation values for 18 weather stations in and

Precipitation—Group 2B

around the New York urban area to see if this urban area had any discernable effects on precipitation patterns. Analyses performed included comparing average precipitation and occur-rence of threshold amounts by day of week and a Markov chain analysis to see if there were changes in probabilities of having sequences of wet or dry days. These analyses did not show any effect of days. These analyses dut not show any effect of the urban area on daily precipitation patterns. A major drawback in this study was the lack of stations in the southeast quadrant and usually downwind of the New York urban center. The analyses provided much useful climatological information. The results from the Markov chain analyses gave probabilities and return periods for sequences of wet and dry days for a network of stations in this area. A huge data bank with daily precipitation values for a network of stations was established and is available for additional analyses. (Humphreys-ISWS) W75-00706

SENSITIVE TIPPING-BUCKET RAIN GAUGE,

Army Electronics Command, Fort Monmouth, N.J. Communication/ADP Lab. J. W. Mink, and E. P. Forrest. Review of Scientific Instruments, Vol 45, No 10, p 1268-1270, October 1974. 3 fig. 3 ref.

Descriptors: *Rain gages, *Rainfall intensity, Precipitation(Atmospheric), *Instrumentation, Rainfall, Measurement. Identifiers: Tipping bucket raingage.

A sensitive tipping-bucket rain gauge was developed to measure rainfall in increments of 0.005 mm with an accuracy better than 0.1%. The receiver area is 200 sq cm with the bucket holding 0.1 ml of precipotation. More than 0.1 ml of precipitation is required for the bucket wheel to be advanced. The depth of the accumulated precipita-tion is sensed electronically and the bucket wheel is advanced with a stepping motor after this depth is sensed. No leakage of accumulated water occurs. The guage was designed to determine the relationship between millimeter wave attenuation caused by rainfall and rainfall rates from 0.3 to 30 mm/h. (Jones-ISWS)

ON THE MODELLING OF CORRELATION FUNCTIONS FOR RAINFALL STUDIES, Hebrew Univ., Jerusalem(Israel).

Journal of Hydrology, Vol 22, No 3-4, p 219-224, 1974. 2 fig, 11 ref.

*Correlation analysis. Descriptors: *Rainfall. Descriptors: "Annian, "Correlation analysis, Rainfall disposition, "Model studies, Rain gages, Storm structure, Air curculation, Homogeneity, Spatial distribution, Seasonal, Network design. Identifiers: "Correlation-distance function, Mesoscale systems.

Correlation analysis has been applied to network design to determine minimum requirements for ob-taining adequately accurate averages of precipita-tion over an aea. Correlation-distance relationship models used in previous studies assume a monotonous decrease of correlation function with increasing distance. The criterion for the inclusion of rainfall days in the samples for deriving the correlation function is arbitrary insofar as they equal days when all raingage stations within an area have rainfall above a certain minimum, or days when at least one station within the area has rainfall above teast one station within the area has rainfail above the minimum, or days of localized convective activity. When rainfall is predominantly derived from small convective cells or from meso-scale systems, the correlation function does not decrease monotonously and may assume significant cant negative values. Another case in which the function is not monotonous is when arrays of convective cells developing in an air mass within a limited span of time reflect a recurring pattern of

spatial organization (not related to fixed points on the ground). Further research is needed to understand the behavior of the correlation function under different circumstances before an effective, all-inclusive model for the correlation-distance relationship can be suggested. (Singh-ISWS) W75-00745

ON THE CHARACTERISTIC CLIMATE AND ITS INFLUENCE ON THE CROP PRODUCTION IN 1971, (IN JAPANESE), Meiji Univ., Kawasaki (Japan). Faculty of

Agriculture. For primary bibliographic entry see Field 3F. W75-00752

COMPARISON OF MULTIQUADRIC SUR-FACES FOR THE ESTIMATION OF AREAL RAINFALL,

Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering. P. S. Lee, P. P. Lynn, and E. M. Shaw Hydrological Sciences Bulletin, Vol 19, No 3, p 303-317, 1974. 8 fig, 2 tab, 3 ref.

Descriptors: *Rainfall. "Rainfall, Precipitation (Atmospheric), "Rainfall disposition, "Depth-area curves, "Distribution patterns, Annual, Precipitation intensity, Isohyets, Meteorology, Rates, Areal, Statistics, Statistical methods, Watersheds (Basins), "Surfaces. Identifiers: Multiquadric surfaces, Surface fitting, Synthetic testing, *United Kingdom.

Multiquadric surfaces constructed from hyperboloids of two sheets, cones, and paraboloids were considered for the representation of the spatial distribution of rainfall. The multiple cone surface was preferred since it is simple, objective, and efficient, and gives estimates of areal rainfall that are usually as good as those obtained with multiquadric hyperboloids. Although the multiple hyperboloid surface may give a better representation of a simple rainfall surface especially if there are few raingauges, its integration is less efficient and its characteristics depend on the preselection of a suitable secondary parameter. The optimum secondary parameter is related to approximately half the scale of the horizontal coordinates, although if this parameter is set too high computational difficulties may occur. Computational difparaboloids. (Huff-ISWS)
W75-00753

SOME ASPECTS OF THE ARABIAN SEA SUMMER MONSOON, Institute of Tropical Meteorology, Poona (India). Tellus, Vol 26, No 4, p 464-476, 1974. 8 fig, 2 tab,

24 ref.

*Monsoons, *Circulation. Descriptors: *Upwelling, *Oceans, Seasonal, Winds, Movement, Clouds, Atmosphere, Mixing, Rainfall, Precipitation(Atmospheric), Air masses, Jets, Summer. Identifiers: *Arabian Sea, *Intertropical convergence zone, India.

Some of the observed features of the Arabian sea summer monsoon, such as the formation of a lowlevel highspeed aircurrent, strengthening of the intertropical convergence zone over northeastern Arabian sea and formation of a secondary convergence zone over southeastern Arabian sea, chang-ing patterns of cloud distributions and formation of double cloud bands over eastern Arabian sea, and rainfall discontinuities along the west coast of India between July and August were discussed in relation to possible complex transformations of airmasses that cross the Arabian sea with a continually changing pattern of surface temperature during the period May through August. It was hypothesised that following coastal upwelling in

Somalia and Arabia during late May or early June. a wedge of cold water is advected across central Arabian sea by the southwest monsoon current and the feed-back effect of this advection upon the atmosphere may be largely responsible for the ob-served monsoon features. (Huff-ISWS)

PHILIPPINE CROP OCCURRENCE ACCORD-ING TO CORONAS CLIMATE TYPES: PRELIMINARY RESULTS,

Philippines Univ., College. Dept. of Soils. For primary bibliographic entry see Field 3F.

PHYSICS AND CHEMISTRY OF SNOWFALL AND SNOW DISTRIBUTION,
Atmospheric Environment Service, Toronto For primary bibliographic entry see Field 2C. W75-00810

MEASURING THE ISOTOPE CONTENT IN PRECIPITATION IN THE ANDES, Gesellschaft fuer Strahlen- und Umweltforschung

m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie. H. Moser, C. Silva, W. Stichler, and L. Stowhas.

In: The Role of Snow and Ice in Hydroldings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 14-23, 1973. 4 fig. 4 tab, 18 ref.

*Deuterium. *Precipitation(Atmospheric), *Topograph
*Mountains, South America, Altitude, Alpit
Temperature, Stable isotopes, Oxygen isotopes.
Identifiers: *Chile(Andes Mtns). *Topography, Altitude, Alpine,

The deuterium content of precipitation in the profile Valparaiso-Santiago-La Parva-Infiernille (Chile) shows an isotope altitude effect. Deuterium content decreases 0.15 to 0.2% for a rise in elevation of 100 m; superposition of a continental effect is found in the coast region and on the east side of the coastal mountains. A preliminary cor-relation of the measurement values available indicated that the isotope content is governed basically by the average temperature during precipita-tion and by the distance of the sampling point from the coast. (See also W75-00809) (Knapp-USGS)

DEVELOPMENT AND USE OF MOUNTAIN PRECIPITATION MAP, Soil Conservation Service, Bozeman, Mont. For primary bibliographic entry see Field 7C. W75-00815

INFLUENCE OF SNOW STORMS ON SNOW

INFLUENCE OF SNOW STORMS ON SNOW COVER FORMATION IN MOUNTAINS, Akademiya Nauk SSSR, Novosibirsk. A. K. Dyunin, A.A. Komarov, and E. P. Isaenko. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 76-81, 1973. 3 for Asset.

*Snow *Snowpacks, Descriptors: cover, *Mountains, Winds, Snow ma Avalanches, Meteorology, Water yield. Identifiers: *USSR. management,

In regions of intensive snowstorm activity the hydrological regime of mountains depends greatly on the local snowstorm conditions. The general on the local snowstorm conditions. The general regularities of snowstorms under conditions of complicated orography were studied by the Novosibirsk Railway Engineering Institute. On the basis of theoretical, experimental, and field research, methods of forecasting snow accumulation and artificial snow control are being worked out. (See also W75-00809) (Knapp-USGS)

Group 2B—Precipitation

W75-00816

VARIATIONS OF DEPTH, DENSITY, WATER EQUIVALENT OF AN ALPINE SNOW COVER IN WINTER (VARIATIONS DE L'EPAISSEUR, DE LA DENSITE ET DE L' EQUIVALENT EN EAU D'UNE COUCHE DE NEIGE ALPINE EN HIVER),

Munich Univ. (West Germany). Geographisches

For primary bibliographic entry see Field 2C. W75-00818

WEATHER CONDITIONS THAT DETERMINE SNOW TRANSPORT DISTANCES AT A SITE IN WYOMING,

Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab. For primary bibliographic entry see Field 2C.

W75-00819

2C. Snow, Ice, and Frost

INSULATION AGAINST ICE AT MEASURING

WEIRS, Norges Tekniske Hoegskole, Trondheim Div. of Hydraulic Engineering.

J. Tveit. Nordic Hydrology, Vol 5, No 1, p 32-49, 1974. 27

Descriptors: *Weirs, *Flow measurement, *Ice, *Insulation, *Water measurement, Calibration, Ice cover, Ice jams, Ice-water interfaces, Hydraulic models, Hydraulic design, Hydraulics, Flumes, Flow rates, Fluid mechanics, Winter. Identifiers: *Norway(Trondheim).

Methods of insulating conventional V-notch weirs and canal weirs were discussed. Laboratory studies were used to determine dimensional relationships for box-like structures covering both the upstream and downstream sides of various weirs. These structures are installed in actual field locations and their performance was evaluated for a wide range of flow and ice conditions. Numerous photographs were used to illustrate the installation and performance of several types of insulation schemes. (Terstriep-ISWS)

TRENCHING ON SHORE AND IN THE OCEAN IN ARCTIC REGIONS: STATE-OF-THE-ART SURVEY,

Civil Engineering Laboratory (Navy), Port Hueneme, Calif. M. C. Hironaka.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as AD-777 046, \$3.75 in paper copy, \$2.25 in microfiche. Technical Note N-1335, March 1974. 48 p, 17 fig, 3 tab, 39

Descriptors: *Trenches, *Polar regions, *Frozen Descriptors: "Trenches, "Polar regions, "Frozen ground, "Reviews, "Dredging, Publications, Arctic, Permafrost, Oceans, Shores, Frozen soils, Soil types, Excavation, Equipment, Rock excavation, Sea ice, Ice, Ice cover, Neritic.

Identifiers: "Arctic trenching techniques.

Study objective was to identify present be used for developing treaches for cables and pipelines in sea-to-shore installations in arctic regions. The results of a literature search were reported. Factors influencing polar trenching opera-tions include: (1) materials to be trenched, (2) protions include: (1) materials to be trenched, (2) properties of permafrost and frozen ground, (3) depth to permafrost or frozen ground, (4) seafloor ice scoring, (5) oceanographic factors, and (6) seasonal surface effects. Terrestrial frozen ground trenching methods include the use of transverse-rotation cutting, ripping and scooping, ripping and dozing, water jetting, drilling and blasting, impact-ing, and thermal cutting. Of these methods, the mechanical methods and drilling and blasting have mecnanical methods and drilling and blasting have been most widely used. Underwater trenching methods include jetting, plowing, dredging, drilling and blasting, and ripping and dozing. Of these methods, jetting and plowing are the most commonly used. For sea-to-shore cable and pipeline installations, present trenching methods have some limitations: thus, it was recommended. have some limitations; thus, it was recommended that a trenching device capable of operating on land, through the surf zone, and in deep water be developed to trench through all material including rock; it should utilize high pressure water jetting, normal water jetting, and suction dredging techniques. (Humphreys-ISWS)
W75-00758

SURFACE PROFILES OF THE LAURENTIDE ICE SHEET IN ITS MARGINAL AREAS, British Columbia Univ., Vancouver. Dept. of

Geology. W. H. Mathews. Journal of Glaciology, Vol 13, No 67, p 37-43, 1974. 2 fig, 27 ref.

*Glaciology. *Îce. Boundaries(Surfaces), Glacial drift, Surfaces, Profiles, Elevation, Mountains, Glaciation, Profiles, Elevation, Mountains, Glaciation, Pleistocene epoch, Glaciers, Antarctic, Terrain analysis, Height, "Canada, Montana. Identifiers: "Ice sheet, "Laurentide ice sheet,

Saskatchewan, Alberta.

Surface slopes of ice lobes can be estimated from the gradients of their margins as shown by ice limits, by contemporaneous recessional moraines, or by lateral melt-water channels, with allowance being made for the dip of an ice lobe laterally, as well as forward, toward its extremities. Profiles wen as forward, toward its extremities. From the can be fitted approximately to a parabola with the equation h = Ax to the (1/2) power in which h is the height above and x the distance up-stream from the terminus in the same units, and A is a coefficient which varies from glacier to glacier. The coefficient A has a value of 4.7 m to the (1/2)power for both the Antarctic ice sheet inland from Mirny and the west central Greenland ice sheet. Several examples of late Pleistocene ice lobes within mountainous terrain of North America and New Zealand have values of A ranging from 2.9 m to the (1/2) power to about 4.1 m to the (1/2) power. For several ice lobes in the south-western part of the late Pleistocene Laurentide ice sheet, vever, values are from about 0.3 to 1.0 m to the (1/2) power, corresponding to basal shear stress of from about 0.07 to 0.22 bar. A major problem exists in accounting for the active movement of ice here under such low surface gradients and basal shear stresses. Evidence of basal slip, aided by high subglacial water pressure, should be looked for in the field. Alternatively, other possibilities for the explanation of such low surface gradients should be sought. (Humphreys-ISWS)

EREBUS GLACIER TONGUE, MCMURDO SOUND, ANTARCTICA, Department of the Environment, Ottawa

(Ontario). Glaciology Div. G. Holdsworth.

Journal of Glaciology, Vol 13, No 67, p 27-35, 1974. 6 fig. 15 ref.

Descriptors: *Glaciers, *Ice, *Antarctic, *Glaciology, Movement, Flow rates, Shear, Descriptors: Stress, Strain, Rates, Shear stress, Strain measurement.

*Erebus Glacier, *Glacier tongues(McMurdo Sound).

Examination of the past and present behavior of the Erebus Glacier tongue over the last 60 years in-dicated that a major calving from the tongue ap-pears to be imminent. Calculations of the regime of the tongue indicated that bottom melt rates may exceed 1 m/yr. By successive mapping of the ice tongue between the years 1947 and 1970, longitudinal strain-rates were determined using the change in distance between a set of 15 teeth, which are a prominent marginal feature of the tongue. A flow law for ice was assumed: effective shear strain-rate equals (tau/B) to the n power, where tau is the effective shear stress and B is a factor dependent on the ice temperature, composition, and structure. Values of the exponent n = 3 and B = 10 to the 8th power N (cube root of seconds) per sq m were determined. These are in fair agreement with published values. (Humphreys-ISWS) W75-00765

THE TEMPERATURE DEPENDENCE OF

SEISMIC WAVES IN ICE, Muenster Univ (West Germany). Institut fuer Reine and Angewandte Geophysik.

Journal of Glaciology, Vol 13, No 67, p 144-147, 1974. 2 fig. 2 tab. 20 ref.

Descriptors: "Ice, "Seismic waves, "Seismic studies, Temperature, Velocity, Seismology, Sound waves, Ultrasonics, On-site data collections, Antarctic Identifiers: P-waves, S-waves, *Greenland.

All available seismic velocity data from Greenland and Antarctica were used to determine the relation petween seismic velocities and temperatures in the ice. The velocity gradients P-waves = -2.30 m/s deg and S-waves = -1.2 m/s deg are in close agreement with the ultrasonic measurements of Robin (1958), Brockamp, and Querfurth (1965) showing that there is no discrepancy between seismic field and ultrasonic laboratory results. (Humphreys-ISWS) between seismic velocities and temperatures in the W75-00766

RADIO-FREQUENCY INTERFEROMETRY-A NEW TECHNIQUE FOR STUDYING GLACIERS,

National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center. D. W. Strangway, G. Simmons, G. LaTorraca, R. Watts, and L. Bannister. Journal of Glaciology, Vol 13, No 67, p 123-132, 1974. 7 fig. 3 tab., 9 ref. NAS 9-11540.

Descriptors: *Glaciers, *Ice, *Instrumentation, *Interferometry, Research equipment, Sounding, Depth, Exploration, Surveys, On-site data collecions, Frequency, Electromagnetic waves, Radio waves, Remote sensing, *Canada.
Identifiers: *Athabasca Glacier(Canada).

A new method of electromagnetic sounding in resistive electrical environments was developed for sistive electrical environments was developed for use in lunar exploration. It is applicable to the study of terrestrial glaciers and ice sheets. A horizontal electric dipole antenna on the ground is used to transmit power at frequencies of 1, 2, 4, 8, 16, and 32 MHz. A set of orthogonal receiving coils is mounted on a vehicle which traverses away from the transmitter. Field strength is recorded as a function of distance. Waves which travel above the surface interfere with waves from the subsurface, generating interference patterns which can be used to determine the dielectric constant, the loss tangent, and depth to reflecting horizons. The loss tangent, and depth to reflecting horizons. The technique was tested on the Athabasca Glacier in western Canada. At 1, 2, and 4 MHz the ice was found to have a dielectric constant of about 3.3, a found to have a dielectric constant of about 3.3, a loss tangent (tan delta) which is roughly inversely proportional to frequency giving values of f tan delta in the range of 0.25 to 0.35 (where f is in MHz). These values correspond well with the known properties of ice near 0C, which is a temperature typical of temperate glaciers. It was possible to determine the depth of the ice but results were not always consistent with previous seismic and gravity surveys and with drilling. At frequencies of 16 and 32 MHz, scattering is the dominant feature of the results. At 8 MHz there is

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a transition from clear-cut interference patterns to the scattering patterns. It was suggested that the Athabasca Glacier has a large number of dielectric scatterers with dimensions less than about 35 m, probably due in large part to crevasses. (Humphreys-ISWS) W75-00768

A HEAT-BALANCE STUDY ON MCCALL GLA-CIER, BROOKS RANGE, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,

Alaska Univ. College. Geophysical Inst. G. Wendler, and G. Weller.

Journal of Glaciology, Vol 13, No 67, p 13-26, 1974. 7 fig, 7 tab, 28 ref. NSF GA-10090, GA-28278X.

Descriptors: *Glaciers, *International Hydrological Decade, *Heat balance, *On-site investigations, Evaluation, Heat transfer, Evaporation, Seasonal, Summer, Spring, Ablation, Ice, Glaciology, Arctic, *Alaska, Solar radiation, Climatology, Climatic data, Albedo. Identifiers: McCall Glacier(Alaska).

On the McCall Glacier, an Arctic glacier in the eastern Brooks Range, northern Alaska, a heat balance study was carried out during the summer of 1970 to investigate quantitatively the relationship between energy transfer, climatic parameters, and melting processes. Considering the individual energy balance terms, it was found that radiation is the most important heat source for snow and ice melt. The melting period, 11 weeks long, was quite short. The evaporation overcompensates for what little condensation occurs, and amounts to about 2% of the total ablation. Evaporation is more important in the spring, but becomes decreasingly so during the summer. The melt water which percolates into the snow-pack and refreezes at a lower level is a more effective way of transporting energy into the ground than conduction, and is of importance during the beginning of the melt period. The summer balance is considerably less energetic than over the tundra north of the Brooks Range. The main difference is a higher surface albedo, and to a lesser extent the protected nature of the glacier in a deep valley on a N-S axis, which reduces the duration of possible sunshine by 39% in summer. These are the important factors in maintaining the McCall Glacier and other similar glaciers in an otherwise low precipitation area. (Humphreys-ISWS) W75-00769

ON THE TEMPERATURE GRADIENT IN THE UPPER PART OF COLD ICE SHEETS, Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch. K. Philberth, and B. Federer. Journal of Glaciology, Vol 13, No 67, p 148-151,

Descriptors: *Glaciers, *Ice, *Mathematical studies, Analytical techniques, Mathematics, Equations, Continuity equation, Temperature, Profiles, Velocity, Surfaces, Slopes, Height, Distribution.

The influence of the surface slope on the temperature profile in the upper part of a cold ice sheet can be described by a function which is independent of the geothermal heat and the heat of friction. This function was calculated for two-dimensional and the axisymmetric cases. In the two-dimensional case its simplest form is proportional to the horizontal velocity and to the height above bedrock reduced by a constant; another form of this function is approximately proportional to the square of velocity and height. (Humphreys-ISWS) W75-00770 STABILITY OF THE JUNCTION OF AN ICE SHEET AND AN ICE SHELF,

Northwestern Univ., Evanston, Ill. Dept. of Materials Science; and Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences. J. Weertman.

Journal of Glaciology, Vol 13, No 67, p 3-11, 1974. 4 fig, 7 ref.

Descriptors: *Ice, *Polar regions, *Glaciology, Mathematical studies, Stability, Theoretical analysis, Antarctic, Movement, Velocity, Flow, Sheet flows, Floating, Sea level, Continental shelf, Oceans. Identifiers: *Ice sheet, *Ice shelf.

An analysis was made of the steady-state size of a two-dimensional ice sheet whose base was below sea-level and which terminated in floating ice shelves. Under the assumption of perfect plasticity, it was found that an ice sheet placed on a bed whose surface was initially flat cannot exist if the depth of the bed below sea-level exceeds a critical depth. If this depth is less than the critical level, the ice sheet extends out to the edge of the continental shelf. Similar results were found with more realistic assumptions about the laws govern-ing the flow of ice. If the bed slopes away from the center, the ice sheet can have a stable width that increases in value as the accumulation rate increases or as sea-level is lowered. It is not possible to decide whether or not the West Antarctic ice sheet is in stable equilibrium. It is entirely possible that this ice sheet is disintegrating at present, as suggested by Hughes (1972). (Humphreys-ISWS) W75-00771

SALINITY VARIATIONS IN SEA ICE, Dartmouth Coll. Hanover, N. H. Dept. of Earth G. F. N. Cox, and W. F. Weeks. Journal of Glaciology, Vol 13, No 67, p 109-120, 1974. 11 fig, 1 tab, 10 ref.

Descriptors: *Sea ice, *Salinity, *Ice, *On-site investigations, On-site collections, Glaciology, Water properties, Evaluation, Arctic, Subarctic, Profiles, Distribution patterns, Temperature, Thermocline, Topography, Shape, Seasonal.

The salinity distribution in multi-year sea ice is de-pendent on the ice topography and cannot be adequately represented by a single average profile. The cores collected from areas beneath surface hummocks generally showed a systematic increase in salinity with depth from 0% at the surface to about 4% at the base. The cores collected from areas beneath surface depressions were much more saline and displayed large salinity fluctua-tions. Salinity observations from sea ice of varying thicknesses and ages collected at various Arctic and sub-Arctic locations revealed a strong correlation between the average salinity of the ice S and the ice thickness h. For salinity samples collected from cold sea ice at the end of the growth season, this relationship can be represented by two linear equations: S=14.24-19.39h (h is less than or equal to 0.4 m; S = 7.88-1.59 h (h is greater than 0.4 m). It was suggested that the pronounced break in slope at 0.4 m is due to a change in the dominant brine drainage mechanism from brine expulsion to gravi-ty drainage. A linear regression for the data collected during the melt season gave S=1.58+0.18h. An annual cyclic variation of the mean salinity exists for multi-year sea ice. The mean salinity reaches a maximum at the end of the growth season and a minimum at the end of the melt season. (Humphreys-ISWS) W75-00772

ICE FABRICS AND PETROGRAPHY, MESERVE GLACIER, ANTARCTICA, Ohio State Univ., Research Foundation, Columbus. Inst. of Polar Studies.
P. W. Anderton.
Journal of Glaciales.

Journal of Glaciology, Vol 13, No 68, p 285-306, 1974. 18 fig, 1 tab, 15 ref. NSF GA-205, GA-532.

Descriptors: *Glaciers, *Ice, *Antarctic, *Petrography, Glaciology, On-site data collec-Descriptors: tions, Investigations, Particle shape, Particle size, Evaluation, Cores, Crystals, Cryology, Alpine, Flow rates. Identifiers: *Meserve Glacier(Antarctica), Basal

ice. White ice. Amber ice. Ice fabrics.

Results of petrographic and fabric analysis of finegrained cold ice from the tongue of Meserve Glacier, Antarctica, were described. Most of the basal ice is remarkably uniform in texture and shows an optic-axis fabric with a single strong maximum, which is consistent with the steady-state conditions of flow. Within 0.5 m of the ice-rock interface, irregularities in the bed cause flow perturbations which are correlated with recrystallization and changes in fabric of the ice. Optic axis fabrics in the basal ice show close symmetry relationships with dimensional fabric and deformation symmetry. Grain-size of the ice increases towards the surface of the glacier and the single maximum of the optic-axis fabric undergoes a rotation about the flow vector. In the near surface, where strainrates are relatively much lower, the optic-axis fabric symmetry is not closely related to either deformation symmetry or the dimensional fabric. Syntectonic recrystallization of ice throughout the glacier tongue characteristically produces a strong single-maximum fabric, the orientation of which in relation to the stress field is apparently determined by stress level. Under steady-state conditions of flow, the strength of the maximum also appears to be a function of stress level. (Humphreys-ISWS) W75-00773

THE LOCAL DISTRIBUTION OF STRESS NEAR A POINT OF ZERO SHEAR STRESS IN A RECTILINEAR FLOW FIELD, Washington Univ., Seattle. Geophysics Program. For primary bibliographic entry see Field 8B.

W75-00774

THERMAL EFFECTS OF CREVASSING ON STEELE GLACIER, YUKON TERRITORY, British Columbia Univ. (Vancouver). Dept. of Geophysics and Astronomy G. T. Jarvis, and G. K. C. Clarke. Journal of Glaciology, Vol 13, No 68, p 243-254, 1974. 6 fig, 2 tab, 19 ref, 2 append.

Descriptors: *Glaciers, *Canada, *Thermocline, *Mathematical models, On-site investigations, Melt water, Glaciology, Temperature, Ice, Numerical analysis, Diffusion, Equations, Freezing, Finite element analysis.
Identifiers: *Steele Glacier(Canada), *Crevasses, Yukon Territory, Thermal effects.

Ice temperature measurements were made in Steele Glacier to a depth of 114 m. All measured temperatures were below 0C, the coldest being - 6.5C at a depth of 114 m. The temperature profile indicates an anomalously warm layer of ice between 30 m and 50 m, which is probably due to the freezing of water in crevasses opened during the 1965-1966 surge. A two-dimensional model of a cold glacier with partially water-filled crevasses predicted temperature profiles very similar to that observed. (Humphreys-ISWS) W75-00775

THE EFFECT OF SLOPE, EXPOSURE AND MOUNTAIN SCREENING ON THE SOLAR RADIATION OF MCCALL GLACIER, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE, Alaska Listic College Genthysical Inst. Alaska Univ., College. Geophysical Inst. G. Wendler, and N. Ishikawa. Journal of Glaciology, Vol 13, No 68, p 213-226, 1974. 13 fig, 5 tab, 20 ref. NSF GA-28278X, GA-37306.

Group 2C-Snow, Ice, and Frost

Descriptors: *Glaciers, *Alaska, *International Hydrological Decade, *On-site investigations, Topography, Slopes, Valleys, Ablation, Arctic, Mountains, Evaluation, Solar radiation. Identifiers: *McCall Glacier(Alas), Brooks Range, Equinox, Solar declination, Mountain screening.

The McCall Glacier is located in the Brooks Range, north Alaska. Most of its slopes have a northerly exposure with an inclination between 5 degrees and 15 degrees. The reduction in direct solar radiation owing to this northerly exposure is small (1.7%) in summer, as the reduction in radiation received on a north slope during the noon hours is mostly compensated by the increase of energy during the 'night' hours, because the sun does not set at that latitude in summer. With the shortening of the solar path, the decrease in direct solar radiation as compared with a horizontal sur-face becomes more important. At the equinox the loss is 24.8%, and at a solar declination of -10 degrees (20 October or 24 February) even higher with 32.6%. A further reduction in solar radiation is caused by the steep mountains which surround the McCall Glacier. The duration of sunshine is reduced during the ablation period by nearly 40%, representing an energy loss of only 13.4%, as the screening effect of the mountains is most important with low solar angles. The screening effect of the mountains becomes more severe with lower sun angles and shorter paths of the sun. During the equinox a loss in duration of 67.6%, and in energy of 55.7% is observed. For a solar declination of -10 degrees, there is hardly any direct sunshine on the glacier at all. There is then a loss in duration of 93.6%, resulting in a loss of energy of 87.8%. Together, these two components reduce the direct solar radiation by about 15% in the ablation period, 67% at the equinox and more than 90% at a solar declination of -10 degrees. (Humphreys-W75-00777

THE YARMOUTH DRUMLIN FIELD, NOVA SCOTIA, CANADA, Windsor Univ. (Ontario). Dept. of Geology.

C. P. Gravenor. Journal of Glaciology, Vol 13, No 67, p 45-54, 1974. 3 fig. 1 tab, 16 ref.

Descriptors: *Glaciation, *Glacial drift, *Ice, *Canada, Petrology, Geology, Petrofabrics, Geomorphology, Terrain analysis, Glaciers, Graded, Glacial soils, Till.
Identifiers: *Drumlin(Nova Scotia).

The Yarmouth drumlinized area is a relatively small field of about 150 drumlins located south and south-east of the town of Yarmouth, Nova Scotia. An analysis of the drumlin shapes indicated that in the majority of cases the stoss end is on the southern extremity of the drumlin. This would suggest that the ice moved in from the south, a concept which is contradictory to pebble lithology and fabric analysis of the till in the drumlins and sur-rounding ground moraine. The drumlin field is anomalous in other respects in that the drumlin density is very low compared with other fields, and granulometric analysis showed that the drumlins are composed of coarse-grained material with only minor amounts of clay. It was suggested that the drumlins were originally formed by south to south-easterly flowing ice but during a later phase of glaciation a local center of outflow, probably short-lived, developed south of Yarmouth on the continental shelf, and the drumlins were reshaped by ice flowing toward the north prior to the disap-pearance of this center. Thus this area of drumlins was presumably not affected by the later area of outflow centered on the interior upland of western Nova Scotia which was hitherto believed to account for the Yarmouth drumlins. (Humphreys-ISWS) 75-00778

THE COMBINED HEAT, ICE AND WATER BALANCE OF MCCALL GLACIER, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,

Alaska Univ., College. Geophysical Inst. G. Wendler, and N. Ishikawa. Journal of Glaciology, Vol 13, No 68, p 227-241, 1974, 10 fig, 9 tab, 25 ref. NSF Grant GA-28278X, GA-37306

Descriptors: *Glaciers, *Alaska, *International Hydrological Decade, *Water balance, *Heat balance, On-site investigations, Evaluation, Precipitation(Atmospheric), Evaporation, Runoff, Discharge(Water), Ablation, Rainfall, Snowfall. Identifiers: *McCall Glacier(Alas), *Ice balance, Brooks Range, Radiation balance.

The combined heat, ice, and water balance was calculated for the McCall Glacier basin (30.6 sq km) for a 36 day period in summer of 1971. This period represents about half the ablation period in this region. The heat balance was measured by detailed observations over ice, and secondary stations were established over snow and moraine faces. The heat balances calculated for stations located respectively on ice and snow surfaces vere assumed to be representative of all such surfaces. The moraine station was only used to obtain evaporation data for areas of the basin not covered by glacier (totalling about 70%). Corrections were made to the radiative fluxes owing to screening of the surrounding mountains and the exposure of the glacier. The ice balance was calculated using 80 ablation-accumulation stakes and the discharge was measured with a water-level recorder, which was calibrated with a current meter. The precipitation was measured with seven rain gauges. Compared with the direct run-off measurements, the values calculated from the heat balance gave a value 5.5% higher, and the stake measurements a value 8.9% lower. This agreement was considered satisfactory and strengthens confidence in the methods employed in each of the three individual calculations. (Humphreys-ISWS) W75-00790

RECENT 'ANNUAL' MORAINE RIDGES AT AUSTRE OKSTINDBREEN, OKSTINDAN, NORTH NORWAY, Reading Univ. (England). Dept. of Geography. P. Worsley.
Journal of Glaciology, Vol 13, No 68, p 265-277, 1974 8 fg. 3 ref. 1974. 8 fig. 3 ref.

*Glacial *Glaciers, Descriptors: drift. *Glaciology, *Terrain analysis, Till, Glacial soils, Geomorphology, Movement, Ice, Ablation, Glaciation.
Identifiers: *Norway(Glacier Austre Okstindbreen), Moraine ridges.

A series of minor moraine ridges lying on a lodgement till surface in front of the glacier Austre Okstindbreen were described. The available chronological control suggested that from 1957 heaven 1957 heaven a supplementation of the surface of the chronological control suggested that from 1974 through 1970 a new ridge was formed each winter and that this pattern of annual production is probably also applicable to the period back to circul 1950. During the winter months of 1970-71 and 1971-72 the glacier advanced and deformed the ice cover of a marginal lake which now isolates the till areas from the ice margin. It was concluded that the ridges are true 'annual' moraines formed primarily by ice push although the operation of a squeeze process during their genesis was not re-jected. (Humphreys-ISWS)

THE MEDIAL MORAINES OF THE LOWER GLACIER DE TSIDJIORE NOUVE, VALAIS, SWITZERLAND,

Southampton Univ. (England). Dept. of Geog-

raphy. R. J. Small, and M. J. Clark. Journal of Glaciology, Vol 13, No 68, p 255-263, 1974. 5 fig, 2 tab, 7 ref.

Descriptors: *Glaciers, *Glacial drift, Glaciation, Glaciology, Ablation, Ice, Alpine, Detritus, Ero-

Identifiers: *Switzerland(Glacier de Tsidjiore Nouve), *Moraine development models.

The two medial moraines of the Glacier de Tsid-jiore Nouve are nourished by rock debris revealed at the surface by progressive ablation down-glacier. The sources of the moraine appear to be rock outcrops marginal to or above the Pigne d'Arolla ice fall, much of the detritus entering the glacier via crevasses either at the summit or the base of the ice fall. The role of differential ablation in the emergence of the moraines as relief features was illuminated by measurements made in the late summers of 1971 and 1972. The eventual decline of the moraines down-glacier is related to factors of reducing debris supply, lateral sliding and ac-celerated ablation due to attenuation of the detrital cover to a mean thickness of 1 cm or less. A model of moraine development, different in several respects from that proposed by Loomis (1970) for the Kaskawulsh Glacier, Alaska, was outlined. (Humphreys-ISWS) W75-00792

RECOMMENDED PRACTICE FOR COM-BATTING ICE JAMS,

V. I. Sinotin. Available from NTIS, Springfield, Va 22161 AD-769 723 \$5.25 in paper copy, \$2.25 in microfiche. Army Cold Regions Research and Engineering Laboratory Report 400, August 1973. 10 p., 5 fig, 11 tab, 48 ref. Draft Translation of 'Metodicheskiye Vkazaniya Po Borbe s Zatorami i Zazhorami L'da' VNIIG, Lennigrad, 1970.

Descriptors: *Ice jams, *Navigation, *Ice loads, Hydraulic structures, Streams, Rivers, Ice cover, Ice breakup.
Identifiers: *USSR, *Ice control.

Ice jams occur in most USSR rivers. They are a serious danger by causing floods and the possibility of destruction of hydraulic engineering structures by ice. The processes of ice jam formation vere studied on a number of large rivers of the USSR. Standard practices are given to aid in selecting the most feasible combination of measures for ice control under local conditions. The most effective of the preventive measures capable of eliminating completely the ice jams in a river are the construction of a series of hydroengineering complexes to achieve a basic change in the hydrologic, thermal and ice regime. The basis of repeated preventive measures which are conducted almost every year is the control of ice ru-noff by weakening and destruction of ice cover in order to accelerate the opening in some sector with intensification of the ice cover and delay of opening in other sectors. (Knapp-USGS) W75-00808

THE ROLE OF SNOW AND ICE IN HYDROLO-

Proceedings of Banff Symposium; September 1972: International Association of Hydrological Sciences Publication 107 (Volume 1 and 2), 1973. 1484 p (total of Vol 1 and 2).

Descriptors: *Snow, *Ice, *Snow surveys, *Runoff forecastings, *Hydrology, Conferences, Glaciers, Glaciohydrology, Melting, Melt water, Snowfall, Snowpacks, Freezing, Lake ice, Sea ice, Ice cover, Snow cover, Precipitation gages, International Hydrological Decade.

The International Symposia on the Role of Snow The International Symposia on the Kole of Snow and Ice in Hydrology were organized within the framework of the International Hydrological Decade. The Symposia comprised two conferences: one on Properties and Processes; the other on Measurement and Forecasting. The work of the Symposia included the presentation and discussion of the present state of the art and the

evaluation of future developments in both fields of interest by means of survey and research papers; both current and 'avant-garde' developments were discussed. Subjects include physics and chemistry of snowfall and snow distribution; conditioning, ripening and melting of snow cover; ground conditions and water movement; properties and processes of glaciers; properties and processes of river and lake ice; measurement in space and time; forecasting runoff; measurement and forecasting specific to glaciers; measurement and forecasting specific to river and lake ice; and modification of snowfall, snow cover, and ice cover. (See W75-00810 thru W75-00925) (Knapp-USGS) W75-00809

PHYSICS AND CHEMISTRY OF SNOWFALL AND SNOW DISTRIBUTION, Atmospheric Environment Service, Toronto

(Ontario).

T. L. Richards.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 1-13, 1973. 4 fig, 3 tab, 13 ref.

Descriptors: *Snowfall, *Cloud physics, *Chemistry of precipitation, Reviews, Snow-packs, Water chemistry, Snow cover, Precipitation(Atmospheric).

Snow, both falling through the air or accumulating on the ground, is discussed as an important phase of the hydrologic cycle. The initial snowfall is produced almost entirely by means or synoptic scale or large mesoscale physical processes associated with traveling low pressure areas or organic or convective lifting. The ultimate distribution and physical characteristics of the snow cover on the ground is, however, highly dependent upon local variations of wind caused by small-scale topographic features and by even smaller-scale energy processes in the snowpack itself. Although there are chemical aspects to the nucleation process the major chemical constituents of the snow cover are the result of the scavenging effects of the falling snow and dry fallout on the snow it-self. (See also W75-00809) (Knapp-USGS) W75-00810

MEASURING THE ISOTOPE CONTENT IN PRECIPITATION IN THE ANDES, Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie. For primary bibliographic entry see Field 2B. W75-00811

O-18/O-16 ABUNDANCE VARIATIONS IN SIER-RA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH. Calgary Univ. (Alberta). Dept. of Physics.

Catgary Univ. (Alberta). Dept. of Physics.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 1, p 24-38, 1973. 6 fig, 11 ref.

isotopes, *Mountains, *California, Temperature, Provenance, Glaciers, Ice, Freezing, Snowpacks, Stable isotopes, Snowmelt, Tracers. Identifiers: *Sierra Nevada(Calif).

Abundances of oxygen isotopes were determined for new fallen snow and snowpacks at 1900 m elevation in the central Sierra Nevada of California during storms in the winters of 1965-68. The O-18 values ranged from -0.5 to -2.6% SMOW. Isotopic minima identified with the coldest winter precipitations were not discernible. Isotopic com-positions were not controlled solely by tempera-ture but depended upon other factors such as wind direction. The isotopic composition of individual layers changed markedly as melt water moved through the pack. These changes were related to through the pact. These changes were reacted to hydrologic processes including ice granule forma-tion and water absorption by individual snow layers. No relation was found between snow density and isotope composition. When ice layers are formed under topographic and atmospheric condi-tions typical of this area, the identification of seasonal trends in glaciers is extremely difficult and subject to misinterpretation. (See also W75-00809) (Knapp-USGS) W75-00812

DEUTERIUM AS A TRACER IN SNOW HYDROLOGY,

Colorado State Univ., Fort Collins. J. Meiman, I. Friedman, and K. Hardcastle. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 39-50, 1973. 4 fig, 4 tab, 7 ref.

Descriptors: *Deuterium, *Tracers, *Snowpacks, *Snowmelt, *Water yield, Hydrology, Hydrogeology, Mountains, Colorado, Snow, Rain, Water sources, Water balance, Stable isotopes. Hydrology,

Average deuterium content of 24 widely dis-tributed samples of April 1 snowpack in the Colorado Front Range averaged -17.2% relative to SMOW. The range extended from -18.0% to 16.5%. Deuterium content of snow was signifi-cantly different from base streamflow and rain and can be used to label snow input to the hydrologic system on small watersheds. Snowmelt on a small forested catchment underwent considerable mixing with water in subsurface storage before appearing as runoff. (See also W75-00809) (Knapp-USGS) W75-00813

SPECIFIC ELECTROLYTIC CONDUCTIVITY OF SNOW AND DEEP CORE SAMPLES, CANADIAN ARCTIC ARCHIPELAGO,

Department of Energy, Mines and Resources, Ot-tawa, (Ontario). Polar Continental Shelf Project. R. M. Koerner.

R. M. Acerner.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 51-63, 1973. 5 fig, 3 tab, 9 ref.

Descriptors: *Specific conductivity, *Snow, *Arctic, *Canada, Electrolytes, Water balance, Precipitation(Atmospheric), Provenance, Freezing, Snowmell, Water chemistry. ntifiers: *Canadian Arctic Archipelago

The specific electrolytic conductivities of several snow and deep core samples from the Canadian Arctic Archipelago show maximum values in au-tumn and mid-late winter snow. Percolation of melt water during warm summers greatly reduces the magnitude of these variations. The high con-ductivity values in winter are caused by a decrease of the ratio of snow to soluble material due to a lower snow accumulation rate and smaller snow varies in winter. Prints contributes to high congrains in winter. Riming contributes to high conductivity values in autumn. Significant variations of conductivity occur in the cores from the Devon Island Ice Cap and the Meighen Ice Cap. The cause of the Devon variations is unknown but those in the Meighen core are attributed to soluble material being blown onto the ice cap from sur-rounding ice-free terrain. No significant regional variations of electrolytic conductivity of snow in the Canadian Archipelago were found. (See also W75-00809) (Knapp-USGS)

DEVELOPMENT AND USE OF MOUNTAIN PRECIPITATION MAP, Soil Conservation Service, Bozeman, Mont.

For primary bibliographic entry see Field 7C.

INFLUENCE OF SNOW STORMS ON SNOW COVER FORMATION IN MOUNTAINS, Akademiya Nauk SSSR, Novosibirsk. For primary bibliographic entry see Field 2B. W75-00816

SNOWPACK CALIBRATION ON MARMOT CREEK TO DETECT CHANGES IN ACCUMU-LATION PATTERN AFTER FOREST-COVER MANIPULATION,

Northern Forest Research Center, Edmonton (Alberta). For primary bibliographic entry see Field 7B. W75-00817

VARIATIONS OF DEPTH, DENSITY, AND WATER EQUIVALENT OF AN ALPINE SNOW COVER IN WINTER (VARIATIONS DE L'EPAISSEUR, DE LA DENSITE ET DE L'EQUIVALENT EN EAU D'UNE COUCHE DE NEIGE ALPINE EN HIVER),

Munich Univ. (West Germany). Geographisches Institut

A. Herrmann.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 96-117, 1973. 12 fig. 2 tab. 8 ref.

Descriptors: *Snow cover, *Snowpacks, *Alpine, Vegetation effects, *Altitude, Topography, Mountain forests, Meteorology.
Identifiers: *Munich area(W. Germany).

Effects of elevation, orientation, and vegetation on snow cover were studied in a drainage basin of the lower Alpine slopes south of Munich. Due to the variable antecedent meteorological conditions the strength of relationships tested varied con-siderably. Such data collected according to a stan-dardized sampling scheme may yield results of variable statistical significance due to a limited sample size. (See also W75-00809) (Knapp-USGS) W75-00818

WEATHER CONDITIONS THAT DETERMINE SNOW TRANSPORT DISTANCES AT A SITE IN

Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.

R. D. Tabler, and R. A. Schmidt.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 118-127, 1973. 4

Descriptors: *Snowpacks, *Sediment transport, *Snow cover, *Sublimation, *Wyoming, Winds, Solar radiation, Temperature. Identifiers: *Snow transport.

A mathematical model for the sublimation of wind-blown snow predicts the distance that a par-ticle of given size will travel before completely sublimating; critical variables are particle speed, relative humidity, temperature of the air, and total relative humidity, temperature of the air, and total insolation. Measurements of these conditions, at a site in southeastern Wyoming (elevation 2500 m) during all drifting events over the 1970-71 winter, indicate average transport distances of 460 and 900 m, for particle diameters of 0.010 and 0.015 cm, respectively. (See also W75-00809) (Knapp-USGS) W75-00819

ENERGY EXCHANGE AT AIR-ICE INTER-FACE, Munich Univ. (West Germany). Meteorologisches

Institut

Group 2C-Snow, Ice, and Frost

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 128-164, 1973. 15 fig. 2 tab. 35 ref.

Descriptors: *Energy transfer, *Ice, *Water balance, Climatology, Meteorology, Interfaces, Snowpacks, Mathematical models, Hydrologic cycle, Snow cover, Energy budget. Identifiers: *Ice-air interfaces.

Energy exchange at air-ice interface can be studied through experiments as well as through theoretical models. Both methods demand a thorough treatment of the effects of radiation and turbulence. Two energy exchange models are discussed, one regarding only the processes in the Prandtl layer, the other considering the whole planetary boundary layer. The models give insight into the problems: they allow the study of energy terms, ablation, and runoff as functions of external control of the control of nal parameters, and they offer the possibility of numerical ablation forecasts. The significance of these considerations is not only in applications in hydrology. They are also important for the im-provement of the general circulation models of the atmosphere, which attempt to include boundary layer processes over snow or ice covers. (See also W75-00809) (Knapp-USGS) W75-00820

THEORY OF RADIATION HEAT TRANSFER BETWEEN FOREST CANOPY AND SNOW-

Arizona Univ., Tucson. Coll. of Agriculture. For primary bibliographic entry see Field 2A. W75-00821

SPATIAL AND TEMPORAL VARIATIONS OF THE ALBEDO OF PRAIRIE SNOWPACK, Saskatchewan Univ. (Saskatoon). Coll. of En-

gineering.
A. D. J. O'Neill, and D. M. Gray.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 176-186, 1973. 5 fig, 1 tab, 7 ref.

Descriptors: *Snowpacks, *Grasslands, *Albedo, *Snowmelt, Model studies, Solar radiation, Melting, Energy budget.
Identifiers: *Prairie snowpacks.

Temporal and spatial variability of the albedo of shallow Prairie Snowpacks remains relatively con-stant during the melt-free period, although it is affected by individual snow event activity. Both point and spatially-averaged albedo values decay rapidly with time during the melt period in a manner quite dissimilar from the time decay of albedo usually assumed for deep mountainous packs. The agreement obtained in the temporal variation of albedo of the spatially-averaged values and point measurements suggests that the point values may be extrapolated to provide realistic estimates of the albedo over a watershed. (See also W75-00809) (Knapp-USGS) W75-00822

PRELIMINARY STUDY OF THE THERMAL BALANCE OF THE AMPERE GLACIER, KER-GUELEN (BILAN THERMIQUE DU GLACIER AMPERE KERGUELEN ETUDE

PRELIMINAIRE), Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 187-202, 1973.

Descriptors: *Energy budget, *Melting, *Glaciers, Glaciohydrology, Ablation, Meterology, Antarctic, Winds, Temperature. Identifiers: *Kerguelen Island.

Thermal balance of the Ampere Glacier, Kerguelen, was studied during austral summer in 1971 and 1972. Wind profile was measured at 10 heights above the ice between 25 and 400 cm and temperature and moisture profile at five heights between 25 and 200 cm. Net and solar radiation were measured at 100 cm above the ice. Logarithmic laws give a very good approximation for wind and tem-perature profiles in the 25-200 cm range. Ablation was 6 cm plus or minus 2 cm in 24 hr. A very good correlation has been established with the wind speed at 200 cm. (See also W75-00809) (Knapp-W75-00823

SNOW STRUCTURE, HEAT, AND MASS FLUX THROUGH SNOW, Swiss Federal Inst. for Snow and Avalanche

Research, Davos/Weissfluhioch. M. R. de Quervain.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Siences Publication 107, Vol 1, p 203-226, 1973. 8

Descriptors: *Snowpacks, *Heat transfer, *Mass transfer, *Reviews, Cryology, Snowmelt, Energy budget, Stratification.

A general survey is presented on the basic phenomena governing metamorphism of snow and its permeability to heat, vapor and water. The behavior of several elementary models accessible to calculation reveals the effects of the processes and points to their complex interaction in real snow. These are primarily mass and heat flux whereas snow structure represents primarily a passive medium. (See also W75-00809) (Knapp-USGS) W75-00824

RADIATION SOLAR PENETRATION THROUGH SNOW, Saskatchewan Univ., Saskatoon. Coll. of En-

gineering

A. D. J. O'Neill, and D. M. Gray. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 227-241, 1973. 8 fig, 4 tab, 6 ref.

Descriptors: *Solar radiation, *Snowpacks, *Albedo, Energy budget, Heat transfer, Water yield, Snow, Snowmelt, Snow cover.

Solar radiation penetration and the albedo of snow are coupled and strongly affected by the properties of a shallow active layer adjacent to the snow surface. Rapid extinction of solar radiation occurs in snowpacks shallower than this active layer, where as in deeper packs it proceeds at a slower rate. The albedo of snow is influenced by the un-derlying ground when the depth of the pack is less than the active layer. (See also W75-00809) (Knapp-USGS) W75-00825

PERCOLATION WATER THROUGH HOMOGENEOUS SNOW,

Cold Regions Research and Engineering Lab., Hanover, N.H.

S. C. Colbeck, and G. Davidson. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 242-257, 1973. 11 fig. 2 tab. 7 ref.

Descriptors: *Glaciohydrology, *Percolation, *Snow, Melt water, Porous media, Saturated flow, Unsaturated flow, Porosity, Permeability, Snow-

The gravity-flow theory of water percolation through snow is generalized to include any power-law relationship between permeability to the water ase and effective-water saturation. Experimental observations of water percolation through homogeneous snow are described. The exponent in the lower power law of percolation is about 3 for homogeneous snow. The theory was used to construct diurnal meltwater waves; these compare favorably with observed waves. The differences between the results found for natural snow and those found for repacked snow are discussed. The lower limit of applicability of the gravity-flow theory is uncertain. (See also W75-00809) (Knapp-USGS) W75-00826

A DIMENSIONAL ANALYSIS OF HEAT AND MASS TRANSFER IN A SNOWPACK. Saskatchewan Univ., Saskatoon.
For primary bibliographic entry see Field 2A.
W75-00827

FIELD MEASUREMENTS ON THE FLUX OF WATER VAPOUR THROUGH DRY SNOW, Alaska Univ., College. Geophysical Inst. and Alaska Univ., College. Dept. of Geology. For primary bibliographic entry see Field 7B.

MOVEMENT OF WATER THROUGH SNOW PACK TRACED BY DEUTERIUM AND TRITI-UM.

Iceland Univ. Reykjavik Science Inst. B. Arnason, Th. Buason, J. Martinec, and P. Theodorsson.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 299-312, 1973. 6 fig. 3 tab, 11 ref.

Descriptors: *Snowmelt, *Melt water, *Tracers, *Infiltration, *Glaciohydrology, Model studies, Flow, Lysimeters, *Deuterium, *Tritum, Isotope study, Unsaturated flow, Saturated flow.

Environmental isotopes provide a valuable tool for tracing the movement of water in snowpacks and in temperate glaciers. To test the method, snowmelt was continuously recorded by a snow lysimeter and the water balance of the experiment was established. Deuterium and tritium concentrations in precipitation, snowpack and meltwater were measured in order to trace the movement of water, recrystallization and isotopic exchange in the snowpack. The theoretical model of this process was generally confirmed by the results. (See also W75-00809) (Knapp-USGS) W75-00829

INFILTRATION OF SNOWMELT WATER INTO FROZEN SOIL.

Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). G. A. Alexeev, I. L. Kaljuzhny, V. Ya. Kulik, K. K. Pavlova, and V. V. Romanov.
In: The Role of Snow and Ice in Hydrology;

Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 313-325, 1973. 3 fig, 3 tab, 6 ref.

Descriptors: *Infiltration, *Snowmelt, *Melt water, *Frozen ground, Frost, Equations, Satu-rated flow, Unsaturated flow, Ice, Frozen soils, Soil water movement.

Snow, Ice, and Frost-Group 2C

The interaction between meltwater and frozen soil is discussed. To forecast the volume of snowmelt runoff, it is necessary to compute the volume of infiltration into frozen soil. Formulas are given for computing the depth of formation of impermeable layers, thawing, infiltration losses, and infiltration into frozen soil. These formulas are compared with the results of field experiments. (See also W75-00809) (Knapp-USGS)

GROUND CONDITIONING AND THE GROUNDWATER RESPONSE TO SURFACE FREEZING,

Department of the Environment, Ottawa (Ontario), Water Resources Branch. For primary bibliographic entry see Field 2A. W75-00831

SOIL MOISTURE IN ALPINE MOUNTAIN SLOPES OF COLORADO AND NEW MEXICO, Vrije Universiteit, (Netherlands). Inst. of Earth Sciences. For primary bibliographic entry see Field 2G.

AND HYDROLOGY HYDRAULICS

GLACIERS, Geological Survey, Tacoma, Wash. M. F. Meier.

W75-00832

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 353-370, 1973.

Descriptors: *Glaciohydrology, *Water balance, *Glaciers, *Glaciology, Melt water, Water yield, Regime, Melting, Precipitation(Atmospheric), Snow, Ice, Hydraulics.

Snow accumulation on glaciers is due to precipitation, wind-blown snow, and avalanches. Glacier melting is strongly influenced by surface albedo so that thick snow cover produces less melt water. The significant quantity most easily measured is balance (change in ice mass over a period of time). Net or annual balance can be determined several ways; the new combined system of reporting balance is recommended. Snow changes to firn and then to ice in a complex way that depends on temperature and melt water. Glacier flow permits adjustment of the ice reservoir to changes in input adjustment of the ice reservoir to changes in input and output. Water in a glacier moves through snow as through an unsaturated porous medium. Water probably moves through and under ice in discrete conduits and perhaps also as a thin film at the ice-bedrock interface. This conduit system in a glacier continually changes by melting and plastic flow of the ice. Glacier outburst bloods result from the release of a glacier dammed lake or water body under the glacier. (See also W75-00809) (Knapp-USGS) USGS) W75-00833

GLACIOLOGICAL AND METEOROLOGICAL STUDIES ON THE BOAS GLACIER, BAFFIN ISLAND, FOR TWO CONTRASTING SEASONS (1969-70 AND 1970-71), Colorado Univ., Boulder. Inst. of Arctic and Al-

Colorado Univ., Boulder. Inst. of Arcuc and Arpine Research.
J. D. Jacobs, J. T. Andrews, R. G. Barry, R. S. Bradley, and R. Weaver.
In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 371-382, 1973. 3 fig, 7 ref. DA-ARO Grants D-31-124-G1163 and D-31-124-71-G80 NSF GA-10992.

Descriptors: *Regimen, *Glaciers, *Water balance, *Energy budget, Ablation, Snowfall, Synoptic analysis, Weather, Meteorology, Cli-matology, Canada, Arctic, Glaciology, Glaciohydrology.

Identifiers: *Baffin Island(Boas glacier).

The results of mass and energy balance studies on the Boas Glacier, Baffin Island, Canada, are presented for two contrasting years. For 1969-70 the net winter balance was 0.4 m H20 and the net balance for the year was +0.37 m H20. For 1970-71 the corresponding figures were 0.26 m H20 and -0.2 m H20. In the summer of 1970 net radiation provided 60% of the energy input. Evaporation apparently made a significant contribution to the heat loss. The contrast between the two ablation seasons is analyzed on the basis of synoptic circulation types and climatological parameters. Conditions that favor low summer ablation in this area are: June snowfall above average, in association with cloudly, cyclonic situations (maintaining a high albedo and low global radiation receipts); July temperatures below normal (causing some of the precipitation to fall as snow at higher elevations, slowing the melt of the snowpack, and prabably increasing the contribution of sublimation); average or above-average frequency of cyclonic situations in July, especially those with lows centered over Baffin Island (maintaining thick cloud cover). (See also W75-00809) (Knapp-USGS)

MASS MASS BALANCE STUDIES ON THE WHAKAPAPANUI GLACIER, NEW ZEALAND, Guelp Univ. (Ontario). Dept. of Geography.

R.D. Thompson, and B. R. Kells.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Polication 107, Vol 1, p 383-393, 1973. 5 fig. 4 ref.

Descriptors: *Glaciers, *Water *Regimen, Precipitation(Atmospheric), Glaciology, Climatic data, Meteorological data. Identifiers: *New Zealand(Whakapapanui Glaci-

The Whakapapanui glacier is located just below the crater of the active volcano Mt. Ruapehu, New Zealand, and for the last two decades has been climatically and dynamically 'dead' ice. Mass balance studies revealed a net gain of firm over the glacier in 1968-69 for the first time in 20 years, associated with above average winter precipitation and below average temperatures in the accumulation and ablation seasons. However, the rebirth of placial activity was short lived. A strong negative balance in the following season removed the 1968-69 firn, the 1969-70 neve, and more than 5 m of glacial ice, a total deficit of 413,000 cu m water. (See also W75-00809) (Knapp-USGS)

SNOW ACCUMULATION ON MOUNTAIN GLACIERS, Akademiya Nauk SSSR, Moscow. Institut

Geografii. V. M. Kotlyakov.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 394-400, 1973. 1 tab, 7 ref.

*Snowfall. Descriptors: Precipitation(Atmospheric), *Water balance, *Glaciers, Climatic data, Meteorological data, Data collections, Snowpacks, Regimen, Avalanches. Identifiers: *USSR.

Snow accumulation was measured on the glaciers of the Polar Urals, Caucasus, and Pamir-Alai over the last decade. Calculations of snow drifting and avalanche accumulation and their variability in time are given. The main mass of glaciers is situated in the zone of maximum precipitation. Snow drifting removes as much as 30-50 percent of snow from open glaciers, but increases snow accumula-

tion by 15 percent on valley glaciers and more than doubles it on cirque and slope glaciers. The share of glacier nourishment by avalanches is one-third of that by snow drifts. The differences of accumulation processes during winters of various snow-falls on the glaciers are discussed. (See also W75-00809 (Knapp-USGS) W75-00836

WATER FLOW THROUGH A TEMPERATE

GLACIER,
Geological Survey, Tacoma, Wash.
R. M. Krimmel, W. V. Tangborn, and M. F. Meier.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological Sciences Publication No 107, Vol 1, p 401-416, 1973. 7 fig, 1 tab, 13 ref.

Descriptors: *Glaciohydrology, *Tracers, Melt water, Hydraulics, Pipe flow, Open channel flow, Snow, Water balance, Dye releases, Salts, Streamflow, *Washington, Glaciers. Identifiers: *South Cascade Glacier(Wash).

Dve and salt tracers were used to determine the rate at which meltwater travels from the surface and margin of South Cascade Glacier to the terminus. Good results were obtained using large volumes of Rhodamine B dye when the path required percolation through snow. Salt and dye were used in free-flowing streams disappearing under the glacier margins and into moulins. Velocities in the snowpack were about 0.1 m/hr. Average velocities from the snow surface to terminus were 6 to 27 m/hr, and from moulins and marginal streams 266 to 2450 m/hr. Travel times of dye injected just above the equilibrium line at three dif-ferent times suggest that the speed of flow is influenced by snow depth and the time suggest that the speed of flow is influenced by snow depth and the time of season. The latter influence may be due to seasonal changes of the water storage in the glacier. Experiments in free-flowing streams on the ice surface and at the margins flow within or under the glacier. (See also W75-00809) (Knapp-USGS) W75-00837

HYDROLOGY OF A PARTLY GLACIER-COVERED ARCTIC WATERSHED, Alaska Univ., College. For primary bibliographic entry see Field 2A. W75-00838

ALPINE GLACIER STUDIES WITH NUCLEAR METHODS.

Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs. For primary bibliographic entry see Field 7B. W75-00839

PERIODIC TEMPERATURE INSTABILITIES IN SUB-POLAR GLACIERS,

British Columbia Univ., Vancouver. Dept. of Geophysics.

. Hoffmann, and G. K. C. Clarke.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 445-453, 1973. 3

*Glaciers, *Movement, Descriptors: *Temperature, Melting, Mathematical models, Glaciohydrology, Flow. Identifiers: *Surging glaciers.

A periodic instability in the flow of a subpolar glacier can arise if special conditions for ice thickness, surface temperature, and geothermal gradient are satisfied. This thermal instability could account for the known periodicity of certain surging glaciers and suggests a surge mechanism. A mathematical model is based on thermal insta-

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bilities in subpolar glaciers. The base of a subpolar glacier warms to the pressure melting point of ice allowing a water film to form and initiating sliding. Sliding friction melts additional ice, thickens the water film and accelerates the surge. Deceleration of the surge is caused by advection of cold ice toward the bed, the drop in basal shear stress resulting from thinning and reduced surface slope, and the development of an efficient drainage system at the glacier bed. At the end of the surge advance a discontinuity in the temperature gradient immediately above the below the glacier bed will force the bed to cool below the melting point. A quiescent phase follows until the glacier bed again returns to the melting point and a new surge cycle begins. (See also W75-00809) (Knapp-USGS) W75-00840

PROPERTIES AND PROCESSES OF RIVER AND LAKE ICE,

Laval Univ., Quebec. Dept. of Civil Engineering.

R Michel

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 454-481, 1973. 11 fig, 33 ref.

Descriptors: *Ice cover, *Iced lakes, *Streams, Ice breakup, Freezing, Melting, Frazil ice, Ice, Ice iams, Slush Identifiers: *River ice.

Mechanisms of formation of river and lake ice, the effect of ice cover, and the various mechanisms of breakup as they influence hydrological phenomena are reviewed. Static ice formation begins with the border ice along the shores of rivers and lakes. Dynamic ice formation starts with the varieties in the state of the start of t with the nucleation of frazil particles in supercooled water, accumulates to form slush and floes and, finally, forms a continuous ice cover. The roughness of the ice cover and particular ice formations as elements controlling winter river stages are discussed. The breakup of rivers is briefly reviewed, as are processes of gradual melting and weakening of ice cover, fracturing during rising water levels, and the sudden and jerky movement of ice floes down river. Also discussed is the longer process of melting in lakes. (See also W75-00809) (Knapp-USGS) W75-00841

EXPERIENCES RELATIVE TO THE ICE REGIME IN HUNGARY (EXPERIENCES RELATIVES AU REGIME DES GLACES, ACQUISES EN HONGRIE),

Hydraulic Documentation and Information Center, Budapest (Hungary).

W. Laszloffy

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 482-489, 1973. 6 fig, 3 ref.

Descriptors: *Ice cover, *Iced lakes, *Rivers, Freezing, Data collections, Hydrologic data, Channel morphology, Ice, Floods, Identifiers: *Hungary(Lake Balaton).

The formation, thickening, and structure of the ice cover of Lake Balaton, Hungary, as well as temperature variations occurring in the ice cover and the mechanical consequences of thermal stresses are discussed. Records of river ice have been collected for two centuries. The role of the surface slope in the appearance of ice in rivers, the in-fluence of bed configurations and bed conditions on the development of the ice cover, the process of ice travel, and the role of the spring floodwaves of tributaries are reviewed. Locations conducive to ice barrier formation, the impact of ice conditions on water regime, and the development of extreme water stages upstream and downstream of ice barriers are discussed. (See also W75-00809) (Knapp-USGS) W75-00842

RADIATION AND HEAT BALANCES, THER-MAL REGIME OF AN ICING, Akademiya Nauk SSSR, Novosibirsk. For primary bibliographic entry see Field 2A. W75-00843

ICE FORMATION IN A SMALL ALASKAN STREAM, Alaska Univ., College.

R. E. Gilfilian, W. L. Kline, T. E. Osterkamp, and C. S. Benson

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 505-513, 1973. 3 fig, 9 ref. NSF Grant GA-30748.

Descriptors: *Freezing, *Streams, Frazil ice, Water chemistry, Crystal growth, Supercooling, *Alaska, Ice cover, Sediment transport, Data collections.

Observations and measurements were performed during freezup of a small subarctic Alaskan stream. Measurements were made of the amount and duration of supercooling, radiative heat balance, stream level, and streamflow. The presence of frazil ice particles and subsequent anchor ice formation modified the streamflow and completely changed the physical characteristics of the stream. Redistribution of the anchor ice resulted in rapid transport of sediments. Temperature vs. time curves during periods of supercooling were unlike those obtained from closed systems in both type and amount of supercooling. Laboratory droplet freezing experiments showed that the number of active ice nuclei at the highest nucleation temperature was sufficient to account for the total production of frazil ice particles. Growth of the frazil ice particles caused rejection of impurities to the water phase, increasing the electrical conductivity of the stream water. This increase in stream water conductivity was related to the amount of frazil ice in the stream and thus may be used as a measure of frazil ice discharge. (See also W75-00809) (Knapp-USGS) W75-00844

SALINITY CHANGES IN THE COLVILLE RIVER DELTA, ALASKA, DURING BREAKUP, Louisiana State Univ., Baton Rouge. For primary bibliographic entry see Field 2K.

SEASONAL REGINE AND HYDROLOGICAL SIGNIFICANCE OF STREAM ICINGS IN CEN-

W75-00845

SIGNIFICANCE OF STREAM ICINGS IN CENTRAL ALASKA, Alaska Univ., College Inst. of Water Resources. D. L. Kane, and C. W. Slaughter.
In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 528-540, 1973. 6 fig. 1 tab. 16 ref.

Descriptors: *Ice, *Surface-groundwater relationships, *Alluvial channels, *Alaska, Arctic, Freezing, Ice cover, Runoff, Flood plains. Identifiers: *Icings, *Naleds.

Many streams in Arctic and subarctic regions have accumulations of ice in the channel and nearby flood plain during the winter months. Field data on the rates of growth of these icings and on various climatic factors were collected at a small research watershed near Fairbanks, Alaska. The volume of icing growths was estimated from aerial photographs. Hydrologic implications were derived by comparing the volume of these icings with other elements of the hydrologic cycle. Water involved in icing formation is diverted from winter streamflow; this same water is released from storage by melt in late spring, augmenting streamflow after peak snowmelt runoff. Water yielded by melt of icing is largely available for streamflow, and does not contribute moisture to the soil mantle away from stream channels as does snowpack meltwater. Stream icing in the subarctic, upland research watershed constituted 4% of yearly runoff volume, but amounted to nearly 40% of winter streamflow. Melt occurred over a 4-week period, largely following ablation of the seasonal snowpack. (See also W75-00809) (Knapp-USGS) W75-00846

TYPES OF BREAKUP OF RIVERS IN SIBERIAN ARCTIC AND SUB-ARCTIC ZONES, Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 2E.

HYDRAULIC METHOD FOR EVALUATION OF ICE-GORGES ON RIVERS, Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). or primary bibliographic entry see Field 2E. W75-00848

ICING MOUNDS AS A FACTOR OF FORMA-TION OF RIVER AND UNDERGROUND RU-NOFF IN EASTERN SIBERIA, Akademiya Nauk SSSR, Novosibirsk. Inst. of Cryology. For primary bibliographic entry see Field 2A.

PECULIARITIES OF ICE COVER FORMATION ON RESERVOIRS

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). R. V. Donchenko.

W75-00849

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 564-574, 1973. 3 fig. 1 tab, 11 ref.

Descriptors: *Ice cover, *Iced lakes, *Reservoirs, *Freezing, Frazil ice, Slush, Water temperature, Lake ice.

Depending on the rates of heat loss from free water surfaces and turbulent mixing, supercooling of water accompanied by ice formation mainly occurs either in the surface layer or throughout the entire body. In the first case a complete ice cover is formed very quickly, whereas in the second case the formation of frazil ice occurs and freezeup is slow. On reservoirs without wind waves, supercooling of water to several tenths of a degree occurs only in a thin surface layer. In this layer the formation of initial needle-shaped crystals (ice slush) occurs, and after their congelation a complete ice crust (ice cover) is formed. The freezeup of reservoirs spreads from the shores (shore ice) to the whole water surface (complete freezing). In cases of severe wind and waves on reservoirs, intensive mixing of water masses takes place, which results in vertical heat exchange and mechanical hindrances that prevent ice crystal congelation. The turbulent mixing contributes to the supercooling of the whole water mass; therefore, ice is formed not only at the surface, but at different depths and on the bottom. The main factors determining the intensity of increase of ice cover formation, weather conditions in winter, and hydrological characteristics of the reservoir. (See also W75-00809) (Knapp-USGS)
W75-00850

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COMPUTATION OF THE STRENGTH OF THE MELTING ICE COVER OF RIVERS AND RESERVOIRS AND FORECASTING OF THE TIME OF ITS EROSION,
Hydrometeorological Service of the USSR,

S. N. Bulatov.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 575-581, 1973. 1

Descriptors: *Melting, *Ice cover, *Ice breakup, Iced lakes, Lake ice, Rivers, Thawing, Meteorological data, Solar radiation, Strength. Identifiers: USSR.

An equation is given to determine the strength of An equation is given to determine the strength of melting ice cover, depending on the amount of solar radiation absorbed by the ice. The roles of wind and water level are determined for the process of ice cover erosion in reservoirs and rivers. General relationships are suggested to determine the dates of the beginning of ice drift in reservoirs and breaking up of the ice cover in rivers. (See also W75-00809) (Knapp-USGS)

METHODS OF MEASURING SNOW COVER, SNOWMELT, AND STREAMFLOW UNDER WINTER CONDITIONS,

National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 7B. W75-00852

MAPPING OF SNOWFALL AND SNOW COVER IN NORTH AMERICA, Atmospheric Environment Service, Toronto

For primary bibliographic entry see Field 7C. W75-00853

ROLE OF SNOW AND ICE HYDROLOGY IN

INDIA, Hydraulic Research Station, Jammu (India). T. D. Gulati.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 610-623, 1973. 3 fig. 2 tab.

Descriptors: *Snowfall, *Snowmelt, *Water balance, Mountains, Water yield, Precipitation(Atmospheric), Monsoons, Snowpacks, Cli-

matology. Identifiers: *India(Himalayas).

The Himalayas are the main source of supply for the rivers in the Indo-Gangetic plains both during the monsoon season from rainfall in the lower catchment and during the winter period from snowmelt. The main factors influencing snowfall, its accumulation, and melting are the geography, precipitation, and temperature in the hills. The location, as well as the aspect of the Himalayas, is unfavorable for snow accumulation. The mountains are situated at low latitudes far removed from the sea. They start at a latitude of 27 deg N at their eastern end and, although they stretch for a distance of 1500 miles, they approach a latitude of only 35 deg N at their northwestern end, giving them a nearly east-west direction. The effect of the unfavorable situation is compensated to a certain stretch within this high altitude. About 50 certains treat higher thin altitude. tain extent by their high altitude. About 50 peaks have altitudes greater than 24,000 feet. The snowmelt season begins when the snow starts melting, after having attained its maximum accumulation; it ends, for all practical purposes, when the snow cover disappears or the monsoon sets in, whichever is earlier, as the river runoff after the onset of the monsoon is almost entirely due to rain. The contribution from snow is nearly equal to that from rain in the case of three of the

catchments studied and is much less for the remaining six catchments. (See also W75-00809) (Knapp-USGS) W75-00854

MESOSCALE MEASUREMENT OF SNOW-COVER PROPERTIES, Cold Regions Research and Engineering Lab.,

Hanover, N.H. For primary bibliographic entry see Field 7C. W75-00855

COLLECTION OF ATMOSPHERIC DATA FOR PROJECT SKYWATER,

Soil Conservation Service, Denver, Colo. For primary bibliographic entry see Field 3B. W75-00856

AREAL AVERAGING OF SNOW COVER CHARACTERISTICS, Hydrometeorological Service of the USSR.

Moscow. For primary bibliographic entry see Field 7C. W75-00857

SNOW PLATE EXPERIMENTS ON STANDARD RAIN-GAUGE DEFICIENCY DURING SNOW-FALL Finnish Meteorological Office, Helsinki.

For primary bibliographic entry see Field 7B.

MEASUREMENTS OF EVAPORATION-CON-DENSATION AND MELTING FROM A SNOW COVER, Finnish Hydrological Office, Helsinki.

For primary bibliographic entry see Field 2D. W75-00859

RANDOM SAMPLING TECHNIQUE IN MEA-SURING SNOW-WATER EQUIVALENT IN A DRAINAGE BASIN,

Copenhagen Univ., (Denmark). Dept. of Geography. For primary bibliographic entry see Field 7B.

A NETWORK OF TELEMETERED PROFILING

ISOTOPIC SNOW GAUGES, Aerojet Nuclear Co. Idaho Falls, Idaho. For primary bibliographic entry see Field 7B. W75-00861

W75-00860

PRACTICAL USE OF AIRCRAFT GAMMA-RAY SURVEY OF SNOW COVER IN THE USSR, Hydrometeorological Service of the USSR,

Moscow. For primary bibliographic entry see Field 7B. W75-00862

SNOWPACK WATER CONTENT BY REMOTE SENSING,

National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center. For primary bibliographic entry see Field 7B. W75-00863

REMOTE SENSING OF WATER CONTENT OF SNOW COVER AT ONE POINT OR MORE IN A

MOUNTAIN AREA, Deutscher Wetterdienst, Hohenpeissengerg (West Germany). Meteorologisches Observatorium. For primary bibliographic entry see Field 7B. W75-00864

SNOW MEASUREMENT USING MILLIMETRE WAVELENGTHS, Alaska Univ., College, Inst. of Arctic Environ-

mental Engineering.
For primary bibliographic entry see Field 7B.
W75-00865

MEASUREMENT OF SNOW COVER USING PASSIVE MICROWAVE RADIATION. Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 7B. W75-00866

DETECTING MELTING SNOW AND ICE BY VISIBLE AND NEAR-INFRARED MEASURE-MENTS FROM SATELLITES.

Satellite Service, National Environmental For primary bibliographic entry see Field 7B. W75-00867 Washington, D.C.

COMBINED SOLUTION OF WATER BALANCE EQUATIONS OF THE ATMOSPHERE AND RIVER BASINS FOR DEFINITION OF WATER EQUIVALENT OF SNOW PACK AND TOTAL Akademiya Nauk SSSR, Moscow. Institut Vod-

nykh Problem. For primary bibliographic entry see Field 2A. W75-00868

FIELD EXPERIMENTS OF WINTER FLOW IN

NATURAL RIVERS, Canada Centre for Inland Waters, Burlington (Ontario). For primary bibliographic entry see Field 2E. W75-00869

MEASUREMENT OF DISCHARGE UNDER ICE COVER, Water Survey of Canada, Winnipeg (Manitoba).

For primary bibliographic entry see Field 7B. W75-00870 WINTER MEASUREMENTS OF SUSPENDED

Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 2J. W75-00871

SNOWMELT RUNOFF THEORETICAL PROBLEMS. FORECASTS--Hydrometeorological Service of the USSR, For primary bibliographic entry see Field 4A. W75-00872

TECHNIQUES FOR PREDICTING SNOW COVER RUNOFF, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 4A.

BASIN-WIDE WATER EQUIVALENT ESTIMA-TION FROM SNOWPACK DEPTH MEASURE-

Ontario Ministry of the Environment, Toronto.
Water Quantity Management Branch.
For primary bibliographic entry see Field 4A.
W75-00874

A GRAPHICAL AND STATISTICAL APPROACH TO THE REGIONAL STUDY OF SNOWPACK IN MOUNTAIN AREAS, WITH SPECIAL REFERENCE TO COLORADO AND NEW MEXICO,

Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences. For primary bibliographic entry see Field 7C.

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W75-00875

TWO-YEAR CYCLES IN SOIL MOISTURE RECHARGE, SNOWPACK, AND STREAM-FLOW IN RELATION TO ATMOSPHERIC CONDITIONS, (WITH SPECIAL REFERENCE TO THE UPPER COLORADO RIVER BASIN), Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences. For primary bibliographic entry see Field 2A. W75-00876

EVALUATION OF AIR PHOTOS FOR SNOW-MELT-RUNOFF FORECASTS. Swiss Federal Inst. for Snow and Avalanche Research, Davos, Weissfluhjoch.
For primary bibliographic entry see Field 7C.
W75-00877

DIFFERENCES IN VOLUME OF SURFACE RU-NOFF DURING THE SNOWMELT PERIOD: YELLOWKNIFE, NORTHWEST TERRITO-

Alberta Univ., Edmonton. Dept. of Geography. For primary bibliographic entry see Field 2E. W75-00878

FORECASTING RUNOFF: OPERATIONAL PRACTICES, British Columbia Univ. (Vancouver). For primary bibliographic entry see Field 4A.

SOME APPROACHES TO SNOWMELT PRE-DICTION, Utah State Univ., Logan. For primary bibliographic entry see Field 4A. W75-00880

MATHEMATICAL MODEL OF SPRING FLOOD FORMATION AND POSSIBILITIES OF ITS USE FOR SHORT-RANGE FORECASTING, Hydrometeorological Service of the USSR, Moscow.

For primary bibliographic entry see Field 4A. W75-00881

APPLICATION OF A PARAMETRIC MODEL FOR ESTIMATING SNOW ACCUMULATION AND FLOW FORECASTING, Waterloo Univ. (Ontario).

S. I. Solomon, and A. S. Qureshi. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 981-991, 1973. 4 fig, 5 ref. NRC Grant A-7832.

Descriptors: *Snowpacks, *Streamflow forecasting, *Snowmelt, *Mathematical models, Runoff forecasting, Canada, Temperature, Precipita-tion(Atmospheric).

The Water Survey of Canada, Federal Department of the Environment, is developing techniques for operational flow forecasting under Canadian conditions. Among the various methodologies being tried is a parametric model requiring precipitation and temperature as the only input data. The model is being tested for use in estimating snow accumu-lation on the ground which in turn enables forecasting flows on a monthly basis. The river basin is considered to act basically as three reservoirs that receive a mass and energy input (precipitation and radiation) and release a mass output (evapotranspiration, river flow and groundwater flow). The time lag between the input and generated output is neglected, this being generally acceptable if the computational time interval is large (one month in this case) and the river basin relatively small (not more than a few hundred

square miles). (See also W75-00809) (Knapp-USGS) W75-00882

A NUMERICAL SIMULATION MODEL FOR SNOW STORAGE IN SMALL COASTAL BASINS, SOUTHWESTERN BRITISH COLUM-

BIA, McMaster Univ., Hamilton (Ontario). Dept. of Geography. M.-k. Woo.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 992-1003, 1973.

Descriptors: *Snowpacks, *Canada, *Mathematical models, Snowfall, Water storage, Descriptors: Water yield, Temperature, Simulation analysis. Identifiers: *British Columbia.

A simulation model was developed to produce long-term estimates of snow storage in the humid temperate forest zone of southwestern British Columbia. Data input to the model consists of daily temperature and precipitation records taken from stations situated at valley sites. Snowpack storage is computed as the balance between incoming snow precipitation and outgoing snowmelt in both the forested and open sectors of each of the several altitudinal zones. Results of simulation compare favorably with historical records and field observations. (See also W75-00809) (Knapp-USGS) W75-00883

MODELLING SNOWMELT RUNOFF IN AN ARCTIC COASTAL BASIN, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 2A. W75-00884

DAILY AND SEASONAL RUNOFF FORECAST-ING WITH A WATER BUDGET MODEL. British Columbia Univ., Vancouver. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W75-00885

ROLE OF SNOWMELT IN FORECASTING GREAT LAKES LEVELS,
Department of the Environment, Ottawa (Ontario). Water Planning and Management.
D. F. Witherspoon, R. L. Pentland, and G. W.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1035-1046, 1973. 3 fig, 3 tab, 7 ref.

Descriptors: *Routing, *Water balance, *Great Lakes, *Snowmelt, Forecasting, Water levels, Ru-noff forecasting, Mathematical models, Regula-

In the Great Lakes basin hydrologic lag time is due mainly to the accumulation of snow over the winter period. By routing long-term mean supplies to the Great Lakes it is possible to improve on the standard deviation of recorded lake levels. Forecasting supplies and routing can produce conrorecasting supplies and routing can produce considerable further improvement. The method of estimation used in the model is crude (snowfall minus evaporation). In this model the prediction minus evaporation). In this model the prediction method is based on as sound a physical basis as possible. A running water balance in the basin is maintained, and excess moisture is used as the main supply indicator. The excess moisture is routed to the lakes with linear routing equations, and through the lake system with a model that recognizes the current operating policies in the system, and the existing hydraulic regimes in the connecting channels. (See also W75-00809) (Knapp-USGS) W75-00886

NEW TECHNIQUES IN FORECASTING RU-NOFF FROM SNOW, Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-00888

COMPUTER SIMULATION TECHNIQUES FOR FORECASTING SNOWMELT RUNOFF, Hydrocomp, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 4A.

INFLUENCE OF AIR TEMPERATURE AND SOLAR RADIATION ON SNOWMELT RUNOFF FROM A SMALL WATERSHED, Ottawa Univ. (Ontario). Dept. of Civil Engineer-

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1073-1082, 1973. 3 fig. 1 tab. 2 ref.

Descriptors: *Snowmelt, *Runoff, *Urban hydrology, *Urban runoff, *Canada, Air tempera-ture, Solar radiation, Small watersheds.

Meteorologic and hydrologic data were collected Meteorologic and hydrologic data were collected during the spring runoff period of 1972 on a partly urbanized watershed of approximately 25 hec-tares. Snowmelt runoff from small basins some times follows a diurnal, sinusoidal pattern. This occurred on the basin in question. The times of daily peaks of air temperature and radiation remain relatively constant throughout the snowmelt period for rain-free days. The short-wave radiation peaks at noon, and the air temperatures reach their daily peaks between 1500 and 1700 hours. Air temperature and discharge peak together in the early part of the snowmelt runoff period. During the latter part of the runoff period, however, the radiation and discharge occur at approximately the same time. Air temperature and radiation probably explain most of the snowmelt runoff for rain-free days. (See also W75-00809) (Knapp-USGS) W75-00890

SNOWMELT RUNOFF INVESTIGATIONS FOR DEVELOPING FORECAST METHODS, Hydrometeorological Service of the USSR, Moscow. For primary bibliographic entry see Field 4A. W75-00891

FORECASTING RUNOFF FROM UNIVERSAL SURFACE GAUGE SNOWMELT MEASURE-Agricultural Research Service, Boise, Idaho. Soil

and Water Conservation Research Div. For primary bibliographic entry see Field 4A. W75-00897

THE SIGNIFICANCE OF SNOW IN BRITAIN. Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. Johnson, and D. R. Archer.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1098-1110, 1973. 5 fig. 3 tab, 9 ref.

Descriptors: *Snowmelt, *Runoff forecasting, *Flood forecasting, Reviews, Mathematical Personal Science of the March of Science of

Snow, Ice, and Frost—Group 2C

In the British Isles the occurrence of snow is highly irregular and unpredictable. The contribution of snowmelt to runoff in Britain is smaller than that of rainfall. Its effect on short-term flood runoff is significant. The occasional persistence of snow also influences the runoff cycle during the winter months. A simple model based on the degree-day principle may provide a practical framework for snowmelt flood forecasting and estimating procedures; it may also confirm that the degree-day coefficient for individual catchments correlates with flood volume. (See also W75-00809) (Knapp-USGS)

RUNOFF **FORECASTS** FOR HIGHLY GLACIERIZED BASINS, Norwegian Water Resources and Electricity Board, Oslo. Glaciology Section. For primary bibliographic entry see Field 2A. W75-00894

GLACIER SURVEYS BY THE WATER SURVEY OF CANADA, Water Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 7C. W75-00895

RECENT CHANGES IN THE POSITION OF THE SNOUT OF THE PINDARI GLACIER (KUMAON HIMALAYA), ALMORA DISTRICT, UTTAR PRADESH, INDIA, Geological Survey of India, Chandigarh. A. P. Tewari.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1144-1149, 1973. 3 fig, 4 ref.

Descriptors: *Glaciers, *Melting, Surveys, Move-ment, Ablation, Glaciology, Alpine, Water balance, Climates, Temperature, Regimen. Identifiers: *India(Pindari Glacier)

The snout of the Pindari Glacier, India, was surveyed during October 1966. The retreat of its snout was 1,040 m between 1906 and 1958. The snout was retreated about 200 m further by 1966. The most important and significant feature noticed during 1966 is the separation of the Chhanguch Branch, a tributary to the Pindari Glacier until 1958. As a result of this retreat the two glaciers have two independent ice caves. The snout of the Chhanguch Glacier has retreated about 762 m since 1958. With the retreat of the Chhanguch Branch, several thousand cubic meters of ice have melted away within 8 years. (See also W75-00809) (Knapp-USGS) W75-00896

REGIME OF A SURGING GLACIER BETWEEN ADVANCES, Akademiya Nauk SSSR, Moscow. Institut

Geogram.
L. D. Dolgushin, and G. B. Osipova.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1150-1159, 1973. 6 fig, 5 ref.

Descriptors: Descriptors: *Glaciers, Movement, *Glaciohydrology, Regimen, Flood forecasting, Stress, Strain.
Identifiers: *Surging glaciers, *Glacial surges.

The periodic character of surging glaciers may be used for forecasting glacier floods. Sharp advances of the glaciers are connected with large shear planes and rifts; these form due to the uneven relaxation of tensions in the glaciers. During the buildup stage the evolution of the lower and upper parts of the glacier tongue is in opposition: the lower part receives no nourishment by ice influx from above; the upper part, on the contrary, progressively increases and propagates down the glacier absorbing the degrading lower part. The longitudinal profile of the glacier becomes steeper and steeper and the tension in its body approaches the critical point. The glacier 'ripens' for the next advance. (See also W75-00809) (Knapp-USGS) W75-00897

A SURGE OF THE KOLKA GLACIER AND ITS HYDROMETEOROLOGICAL CON-SEQUENCES, Akademiya Nauk SSSR, Moscow. Institut

Geografii.

A. N. Krenke, and K. P. Rototaev.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 197, Vol 2, p 1160-1171, 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Glaciers, *Glaciohydrology, Movement, Water balance, Melting, Ablation, Melt water, Floods, Flood waves, Unit hydrographs. Identifiers: *Glacial surges, *Surging glaciers, *USSR(Kolka Glacier).

A rapid surge of the small (2.3 sq km) Kolka Glacier in the Caucasus occurred during the autumn and winter of 1969. The glacier advanced 4.6 km in 3.5 months along a narrow valley of the Genaldon River. Tectonic structure after the surge indicates the likelihood of a monolithic ice mass in the interior part of the glacier and great crushing on the surface. The volume of cavities in the glacier after the surge is estimated to be 15%-20%. Recurrent surges in the past had a probable interval of about 70 years. As a result of summer surges water-ice flows took place. The estimate of a possible volume of flooding was based on the amount of the water input in the past and the degree of the glacier porosity. Calculations of the flood transfordown the valley were made based on the method of unit hydrographs. (See also W75-00809) (Knapp-USGS) W75-00898

EFFECT OF SNOW AND ICE ON RUNOFF AT MOUNT RAINIER, WASHINGTON, Geological Survey, Tacoma, Wash.

D. Richardson.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1172-1185, 1973. 5 fig, 3 tab, 14 ref.

Descriptors: *Melt water, *Surface runoff, *Glaciohydrology, *Washington, *Snowmelt, Runoff, Streamflow, Snow, Ice, Snowpacks, Water equivalent, Precipitation(Atmospheric), Ice cover,

Identifiers: *Mount Rainier(Wash), Nisqually Glacier(Wash), Nisqually River(Wash).

Meltwater runoff constitutes 41 to 53 per cent of the total runoff in five basins of the Mount Rainier area, as shown by comparing mean monthly streamflow with monthly 'net precipitation' (mean basin precipitation minus evapotranspiration). The mean water equivalent of the spring snowpack in each basin is estimated on the basis of mean annual precipitation and altitude using a general relationship defined by snow survey data. Estimated meltwater runoff during August and September is greatest in those basins that have the greatest glacier-covered area. A kinematic ice wave on the lower Nisqually Glacier had a volume in 1963 of about 27 million cu m, equivalent to the low-flow runoff of Nisqually River near National for a total of 71 days. (See also W75-00809) (Knapp-USGS) W75-00899 MEASUREMENT AND FOREG SPECIFIC TO RIVER AND LAKE ICE, FORECASTING Hydrometeorological Research Service of the

USSR, Moscow. B. M. Ginsberg.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1186-1195, 1973.

Descriptors: *Ice, *Ice cover, *Iced lakes, *Ice breakup, *Forecasting, Water yield, Streamflow forecasting, Runoff forecasting, Freezing, Thawing, Flood forecasting, Measurement. Identifiers: *USSR.

Studies in the USSR on the problem of forecasting ice formation, accretion, and destruction on rivers, lakes, and in reservoirs are reviewed. Short-range ice forecasts are based on meteorological elements. Long-range forecasts are based on the relation between ice phenomena dates and previous development of atmospheric processes. In long-range ice forecasting, considerable im-portance is attached to a consideration of the effect of the North Atlantic water temperature, the amount of ice in the peripheral Arctic seas and in some other regions, and the state of the underlying land surfaces (snow cover) upon the atmospher processes. (See also W75-00809) (Knapp-USGS) W75-00900

ATMOSPHERIC CIRCULATION AND FORECASTING OF DATES OF ICE FORMA-TION IN RIVERS,

Hydrometeorological Service of the USSR, Moscow.

E. I. Savchenkova.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1196-1201, 1973.

Descriptors: *Ice, *Freezing, *Rivers, *Forecasting, Meteorology, Synoptic analysis, Weather forecasting, Climates, Meteorological *Ice, Descriptors: data, Atmospheric pressure. Identifiers: *USSR.

Long-range forecasting of ice formation in the rivers of the USSR uses the surface pressure and temperature fields and the 500 mb pressure field in natural orthogonal functions. The forecasts are by sectors, selected with an account of the characteristic features of the atmospheric circulation, and are carried out 1 and 2 months before the beginning of ice formation. (See also W75-00809) (Knapp-USGS) W75-00901

COMPUTATION OF CRYSTAL AND SNOW ICE ACCRETION IN RESERVOIRS METEOROLOGICAL DATA,

Hydrometeorological Service of the USSR, Moscow

V. V. Piotrovich, and A. G. Deriugin.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1202-1211, 1973. 3 fig, 12 ref.

Descriptors: *Ice cover, *Iced lakes, *Reservoirs, Snow, Heat budget, Water temperature, Freez-Identifiers: *USSR.

Formulae for computing ice accretion on the lower surface are suggested, taking into account all the components of the heat balance. Techniques for computing the thickness and meteorological elements for representative coastal stations are given.
The accretion is computed from standard meteorological observations for 6-hour intervals

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by means of special tables. A test of these computations was made on the basis of the accurate observations of 24-hour accretion and by means of comparison with the results of ice measurements for a number of USSR reservoirs. Formulae for computing snow ice accretion are suggested in which the buoyancy of ice cover and its snow load are taken into account. The formulae are tested by using data from special observations. Conditions for the formation of the cracks of ice and water movement in snow are discussed. Snow ice formation is greatly affected by human activity. (See also W75-00809) (Knapp-USGS) W75-00902

A CASE HISTORY OF FORECASTING FRAZIL ICE.

National Research Council of Canada, Ottawa (Ontario). Div. of Building Research. G. P. Williams.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1212-1223, 1973. 5 fig. 6 ref.

Descriptors: *Frazil ice, *Weather forecasting, *Freezing, Temperature, Heat transfer, Heat budget, Heat flow, *Canada. Identifiers: *Ottawa River(Canada).

To develop a method for forecasting frazil ice, 20 years' records of blockage of intakes by frazil ice at powerplants on the Ottawa River were examined to define the weather conditions and heat losses under which frazil occurred. Marginal ice blockage took place when the rate of heat loss averaged about 30-40 cal/sq cm/hr for several hours preceding the time when frazil was reported. Ice blockage sufficient to shut down the generators occurred when the rate of heat loss was tors occurred when the rate of neat loss was greater than about 40 callsq cm/hr for 12 hours or more. Almost all frazil problems occurred during westerly or northwesterly flows of relatively dry air, with wind speeds averaging at least 2.25 to 4.5 m/s. (See also W75-00809) (Knapp-USGS)

CALCULATION OF THE FORMATION, GROWTH, AND MELTING OF ICE AND SNOW COVER ON WATER STORAGE RESERVOIRS, Nauchno-Issledovatelskii Kazakhskii Gidrometeorologicheskii Institut, (USSR).

A. P. Braslavsky.

A.P. Brasiavsky.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1224-1230, 1973.

Descriptors: *Ice cover, *Iced lakes, *Reservoirs, *Freezing, *Thawing, Ice, Snow, Meteorology, Forecasting, Weather forecasting, Heat budget, Heat balance.
Identifiers: *USSR(Kazakhstan).

A procedure is given for determining the date of reservoir freezeup, the growth of ice cover thickness during the winter, the date of spring thawing of the snow and ice cover, and the date of termination of reservoir ice thawing. The procedure is based on the equation of reservoir heat balance. Solution of this equation involves transformation of the characteristics of airflow during its movement over the reservoir. The only case considered is the one in which the value of heat advection in the reservoir water is negligible. The procedure was checked by using data obtained on Kazakhstan's water storage reservoirs. (See also W75-00809) (Knapp-USGS) W75-00904

METHOD OF FORECASTING DATE OF BREAKUP OF RIVER ICE, Minami-Kyushu Univ., Takanabe (Japan).

M. Murakami.

M. Murakami.

In: The Role of Snow and Ice in Hydrology;

Proceedings of Banff Symposium, September

1972: International Association of Hydrological

Sciences Publication 107, Vol 2, p 1231-1237, 1973. 2 fig, 1 tab, 7 ref.

Descriptors: *Ice breakup, *Rivers, *Forecasting, *Discharge(Water), Air temperature, Meteorology, Meteorological data, Stage-discharge relations, Flood forecasting, Asia. Identifiers: *China(Sungari River-Harbin).

Breakup of river ice occurs when the eroded ice sheet is separated from the bank and bottom of the river by increasing river stage and is accelerated by melting. In a study of the Sungari River in Harbin, Northeast China, there was a close relation between the number of days from the critical date when air temperature rises above 0 deg C to the date of breakup, and acceleration of increasing river stage before breakup. The critical date of air temperature variation is estimated by the slope of average air temperature variation, represented by a straight line connecting average monthly air tem-perature taken at the middle of March and of April. (See also W75-00809) (Knapp-USGS) W75-00905

SHORT-RANGE FORECASTING OF FLOAT-ING ICE IN RIVERS, LAKES, AND RESER-VOIRS,

Hydrometeorological Service of the USSR,

N. D. Efremova

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1238-1242, 1973.

Descriptors: *Freezing, *Ice cover, *Heat balance, Rivers, Heat budget, Heat flow, Forecasting, Lake ice, Reservoirs, Water temperature, Air temperature. Identifiers: USSR.

A method is given for computing the water colling and dates of appearance of ice in rivers, lakes, and reservoirs. The data required are mean water temperature in section or in depth, specific heat output of the water surface, and coefficient of heat flow from water to the water-air interface. (See also W75-00809) (Knapp-USGS) W75-00906

DURATION OF ICE PHENOMENA AND POSSI-BILITIES OF ITS FORECASTING (FOR THE DANUBE).

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). T. N. Makarevich, Z. A. Efimova, and L. K.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1243-1250, 1973.

Descriptors: *Ice cover, *Freezing, *Rivers, Meteorology, Synoptic analysis, Statistical Climatology, Meteorology, *Forecasting. Identifiers: *Danube River.

The winter ice regime of the Danube is characthe winter ice regime of the Danube is charac-terized by extreme variation and instability. Two schemes for long-range forecasting of ice phenomena duration are proposed: one of them (in a probabilistic form) is based on the use of indices of zonal circulation in Canada; the second scheme separates meteorological fields according to natural components (empirical orthogonal functions) using maps of land pressure. Central Europe is characterized in the majority of cases by a warm winter after a cold autumn. It is seldom possible to expect a severe winter after early frosts. (See also W75-00809) (Knapp-USGS)

LAWRENCE RIVER (L'HIVER GLACIOLOGIQUE LE LONG DU FLEUVE ST-LAURENT), WINTER ICE HISTORY ALONG THE ST.

Laval Univ., Quebec.

B. Michel, and D. Berenger. B. Michel, and D. Berenger.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1251-1282, 1973. 19 fig, 5 tab, 14 ref.

Descriptors: *Ice, *Freezing, *St. Lawrence River, *Canada, Climatology, Climatic data, Air temperature, Meteorological data, Ice breakup,

The characteristics of ice along the St. Lawrence Valley and its gulf are discussed. The notion of degree-days of frost is used extensively to classify winters according to their severity, to establish in a statistical manner the first and last days of winter related to ice formation and breakup and to determine certain ice parameters along the St. Lawrence River. (See also W75-00809) (Knapp-USGS) W75-00908

CHANGES IN ICE CONDITIONS IN REGU-LATED RIVER BASINS, Norwegian Water Resources and Electricity

Board, Oslo. R. P. Asvall.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1283-1295, 1973. 4 fig, 3 tab, 3 ref.

Descriptors: *Ice cover, *Reservoir operation, *Freezing, Hydroelectric plants, Water temperature, Environmental effects. Identifiers: *Norway.

The building of water power systems changes the ice conditions in rivers by changing the hydrological conditions and water temperature. These changes may lead to environmental changes of major importance for the people living in the areas involved. An evaluation of these changes has therefore to be undertaken at the planning stage. To forecast changes in ice conditions, evaluations of ice formation, circulation in rivers and lakes, and cooling of water surfaces are used. These changes have always caused concern in Norway, especially when the regulation of flow has caused reduced ice thicknesses, as ice covered rivers and lakes traditionally have been used as winter roads. Formation of frost fog as a consequence of open water in areas with low air temperatures has also been given much attention lately. (See also W75-00809) (Knapp-USGS) W75-00909

DYNAMICS OF ICE FORMATION IN THE UPPER NIAGARA RIVER, Hydro-Electric Power Commission of Ontario,

Toronto. R. S. Arden, and T. E. Wigle.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1296-1313, 1973.

Descriptors: *Freezing, *Ice cover, *Canada, Water temperature, Frazil ice, Ice, Regime, Iced lakes, Hydroelectic plants. Identifiers: *Niagara River.

Evaporation and Transpiration—Group 2D

The characteristics and patterns of ice production in the Niagara River are discussed. Transient ice crystals in suspension contribute to the growth of anchor ice but once fastened to an object these ice crystals can continue to grow by accretion. Variability of water temperature, its effect on the rate and quantity of ice production, and its significance to river control procedures are important considerations. The measurement of water temperatures in the river posed a number of problems, especially the measurement of temperature at supercooled values and at the water surface. (See also W75-00809) (Knapp-USGS) W75-00910

REGRESSION EQUATIONS RELATING ICE CONDITIONS IN THE UPPER NIAGARA RIVER TO METEOROLOGICAL VARIABLES. Atmospheric Environment Service, Downsview H. L. Ferguson, and H. F. Cork.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1314-1327, 1973. 2 fig. 2 tab. 6 ref.

Descriptors: *Ice, *Freezing, *Ice cover, *Frazil ice, *Regression analysis, Statistics, Statistical methods, Forecasting, Hydroelectric power, *Canada Identifiers: *Niagara River.

Ice formation in the upper Niagara River on cold winter nights may be predicted using energy balance by observable meteorological variables, which can be related to freezing by multiple regression analysis. Depending on the number of variables employed, as much as 85% of the variance in ice flow at the Niagara Control Dam can be explained. A second set of regression equations explains as much as 80% of the variance in streamflow retardation resulting from anchor ice forma-tion. (See also W75-00809) (Knapp-USGS) W75-00911

HEAT LOSSES AND SYNOPTIC PATTERNS RELATING TO FRAZIL ICE PRODUCTION IN THE NIAGARA RIVER,
Toronto Univ. (Ontario). Dept. of Physics.

R. List, and L. A. Barrie. In: The Role of Snow and Ice in Hydrology;

Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1328-1338, 1973.

Descriptors: *Frazil ice, *Rivers, *Meteorology, "Synoptic analysis, Freezing, Ice cover, Heat flow, Heat balance, Heat budget, Convection, Evaporation, *Canada. Identifiers: *Niagara River.

The relationships of frazil ice production in the Niagara River to the meteorological situation and to the surface heat loss were investigated. Cold arctic air behind a cold front was over the river during at least 70% of the time that frazil ice was observed. In the cases where no ice production was reported the river was essentially either in warm air masses of frontal waves with a tempera-ture of > -2 deg C or in regions just ahead of advancing warm fronts with a temperature of < 0 deg C. A correlation is suggested between ice production and convective or evaporative heat loss. No relationship is found between ice production and radiative heat loss from the river's surface. A nonzero cutoff value below which there was no frazil ice was estimated for each of the heat loss components. There is no systematic variation of ice production with wind direction. (See also W75-00809) (Knapp-USGS) W75-00912

UTILITY OF IMAGING RADAR FOR THE

STUDY OF LAKE ICE, Michigan Univ., Ann Arbor. Dept. of Geography. For primary bibliographic entry see Field 7B. W75-00912

PREPARATION OF ARTIFICIAL SNOW AND ICE SURFACES FOR XI OLYMPIC WINTER GAMES, SAPPORO,

Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science. D. Kuroiwa, and E. R. LaChapelle.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1350-1369, 1973. 6 fig, 2 tab, 20 ref.

Descriptors: *Ice, *Snow, *Winter sports, *Skiing, *Ice skating, Cryology, Freezing, Snow management, Snowpacks. Identifiers: *Japan(Winter Olympic Games).

Modern Winter Olympic competitions have almost completely ceased to use natural snow and ice surfaces. A systematic study of artificially prepared snow and ice, begun in 1968, lead to the definition of criteria and preparation methods that were used during the XI Olympic Winter Games. Extensive manpower was applied from the beginning of winter to attack the most difficult problem, that of preparing a sufficiently durable snow surface for the alpine ski events. Ice of exceptionally high purity and controlled crystal size was mechanically prepared for the skating events. Proper management of the age-hardening process in snow could lead to a satisfactory racing surface. (See also W75-00809) (Knapp-USGS) W75-00914

MODIFICATION OF SNOW ACCUMULATION BY CLOUD SEEDING IN THE GREAT LAKES

National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research

For primary bibliographic entry see Field 3B. W75-00915

SNOW SURFACE MODIFICATION, Colorado State Univ., Fort Collins For primary bibliographic entry see Field 3B. W75-00916

SMALL OPENINGS IN POPLAR FOREST IN-CREASE SNOW ACCUMULATION, Northern Forest Research Center, Edmonton (Alberta).

For primary bibliographic entry see Field 3B. W75-00917

SNOW FENCES FOR INFLUENCING SNOW ACCUMULATION,
Forest Service (USDA), Fort Collins, Colo. Rocky

For primary bibliographic entry see Field 3B. W75-00918 Mountain Forest and Range Experimental Station.

RELATION OF WIND EXPOSURE AND FOREST CUTTING TO CHANGES IN SNOW ACCUMULATION, Forest Service (USDA), Moscow, Idaho. Forestry

For primary bibliographic entry see Field 3B. W75-00919

A THEORETICAL STUDY OF ICE SURFACE DUSTING INFLUENCE ON MELTING INTEN-SITY.

Akademiya Nauk SSSR, Moscow. Institut Geografii. For primary bibliographic entry see Field 3B.

W75-00920

W75-00922

POSSIBILITY OF ARTIFICIAL AUGMENTA-TION OF MELTING BY SURFACE DUSTING OF GLACIERS (RESULTS OF SOVIET IN-VESTIGATIONS), Akademiya Nauk SSSR, Moscow. Institut

Geografii.

For primary bibliographic entry see Field 3B. W75-00921

THERMAL MODIFICATION OF RIVER ICE COVERS: PROGRESS AND PROBLEMS, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 5B.

MODIFICATION OF ICE COVERS AND SUB-SEQUENT RUNOFF BY MAN-MADE STRUC-

Hydro-Electric Power Commission of Ontario. Toronto.

For primary bibliographic entry see Field 4A. W75-00923

ICE FORMATION IN LAKE ERIE AND THE NIAGARA RIVER, ITS EFFECTS AND CON-TROL, Water Survey of Canada, Guelph (Ontario).

For primary bibliographic entry see Field 4A. W75-00924

IMPACT OF SNOWPACK MANAGEMENT ON SNOW AND ICE HYDROLOGY, Bureau of Reclamation, Denver, Colo. Engineering and Research Center. For primary bibliographic entry see Field 3B. W75-00925

THE MICROCLIMATE OF ARCTIC PLANTS AND ANIMALS, ON LAND AND IN FRESH WATER, Waterloo Univ. (Ontario). Dept. of Biology.

For primary bibliographic entry see Field 21.

2D. Evaporation and Transpiration

A WATER BALANCE ON A SMALL AGRICUL-WATERSHED, LATAH COUNTY, IDAHO.

Idaho Univ., Moscow. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 2A. W75-00552

TRANSPIRATION RATES IN THE LUQUILLO MOUNTAINS OF PUERTO RICO. Puerto Rico Dept. of Public Works, San Juan. Area of Natural Resources. P. L. Weaver, M. D. Byer, and D. L. Bruck. Biotropica, Vol 5, No 2, p 123-133, 1973, Illus.

Descriptors: *Transpiration, Forests, *Puerto Rico, *Rain forests. Identifiers: Luquillo mountains.

Transpiration in elfin woodland on a peak at 1000 m and in montane rain forest at 550 m was found to be extremely low when compared to most other rates reported in the literature, regardless of habitat. Apparently, transpiration differences between the 2 habitats studied depended upon weather conditions. The extremely low saturation deficits of the air in these habitats, frequent cloud moisture deposition, and low insolation reaching the leaves because of frequent fog and closed canopy appear to be the major causes of the slow

Group 2D-Evaporation and Transpiration

transpiration; inefficient xylem and effective scarcity of certain minerals may also be involved. Transpiration of sclerophyllous-leaved species characteristic of elfin forest was similar to that of membranaceousleaved species from the montane rain forest. Sclerophylly appears to resist defolia-tion by strong mountain winds, rather than reduce transpiration as in some habitats. Inefficient base pumping due to slow transpiration, combined with mechanical wind pruning, is proposed as a major cause of tree height reduction in elfin forest. The proportionately greater stomatal area of elfin forest leaves as compared to their montane rain forest counter-parts suggest that plants adapt to counteract this reduced transpiration.--Copyright 1974, Biological Abstracts, Inc.

EVAPORATION FROM LAKE MICHIE, NORTH CAROLINA 1961-71.

Geological Survey, Raleigh, N.C. W. L. Yonts, G. L. Giese, and E. F. Hubbard. Available from NTIS, Springfield, Va 22161 as PB-236 265/As, \$3.25 in paper copy, \$2.25 in microfiche. Water-Resources Investigation 38-73, 1973. 27 p, 9 fig, 4 tab, 9 ref.

Descriptors: *Evaporation, *Reservoirs, *North Carolina, *Reservoir evaporation, Water loss, Hydrologic data, Data collections Identifiers: Durham(NC), *Lake Michie(NC).

Evaporation data were collected at Lake Michie. Durham N. C., a 480-acre water-supply reservoir, for 10 consecutive years from September 1961 to September 1971. Wind speed, air temperature, and water temperature were used in conjunction with water-budget data to calibrate the semi-empirical mass-transfer equation. During the study period the average annual evaporation from Lake Michie was 37.9 inches. Within-year variation of evaporation from the lake is sinusoidal, with a high during July averaging 4.71 inches and a low during January averaging 1.45 inches. Evaporation from Lake Michie was 0.72 (or about three-quarters) of the evaporation from the National Weather Service evaporation pan at Chapel Hill. This ratio, called a pan coefficient, was not constant throughout the year, ranging from an average of 0.57 for April to .09 for December. Average annual net evaporation (evaporation minus rainfall) for the study period was -1.02 inches, that is, rainfall exceeded evaporation by 1.02 inches per year. Typically, evaporation exceeds precipitation for the months of April through October and is less for the remainder of the year. Net evaporation is a signifi-cant factor in the design and management of reservoirs. For example, over 14.5 inches of net evaporation from Lake Michie may be expected to occur during a 6-month period on an average of once every 20 years. (Knapp-USGS)
W75-00634

THE DEVELOPMENT OF HYDROLOGICAL CONCEPTS IN BRITAIN AND IRELAND BETWEEN 1674 AND 1874,

University Coll., Dublin (Ireland). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-00754

MEASUREMENTS OF EVAPORATION-CON-DENSATION AND MELTING FROM A SNOW

COVER, Finnish Hydrological Office, Helsinki. R. Lemmela.

R. Lemmeia.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 1, p 670-679, 1973. 2 fig, 5 tab, 15 ref.

*Snowmelt, Descriptors: *Evaporation. Meteorological data, Regression analysis, Data collections, Solar radiation, Air temperature, Humidity, Snow cover, Snowfall, Melt water. Identifiers: *Finland.

To assess the effect of climatic characteristics on snowmelt and evaporation from snow cover, hydrometeorological observations were made in an open area in southern Finland during the period 1968-1972. Total and net radiation, wind speed and direction, air temperature and humidity at dif-ferent levels, accumulation and decrease of snow cover, density, water equivalent and liquid water cover, density, water equivalent and induit water content of the snow, evaporation and condensa-tion during the period of snowmelt, the amount of melt water released by the snow cover, and infli-tration of melt water were measured. The best variables to explain snowmelt were degree day factor and net radiation. In multiple regression analyses the model contained degree day factor, snow density, and net radiation. The best variables to explain net evaporation were relative humidity and saturation deficit. (See also W75-00809) (Knapp-USGS) W75-00859

SNOW SURFACE MODIFICATION. Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 3B. W75-00916

INTERNAL CONTROL OF STOMATAL PHYSIOLOGY AND PHOTOSYNTHESIS I. STO-MATAL REGULATION AND ASSOCIATED CHANGES IN ENDOGENOUS LEVELS OF ABSCISIC AND PHASEIC ACIDS,

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Horticultural Research.

For primary bibliographic entry see Field 2I. W75-01012

CHARACTERISTICS OF WATER REGIME AND PRODUCTIVITY OF VEGETABLE CROPS WITH DIFFERENT MINERAL NUTRITION, (IN RUSSIAN).

For primary bibliographic entry see Field 3F. W75-01095

2E. Streamflow and Runoff

FLOOD HYDROGRAPH SYNTHESIS FOR RURAL PENNSYLVANIA WATERSHEDS, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 2A. W75-00557

THE ECOLOGY OF THE NAVASOTA RIVER,

TEXAS, Texas A and M Univ., College Station. Water Resources Inst. W. J. Clark.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PB-236 927, \$8.75 in paper copy, \$2.25 in microfiche. Technical Report No 44, December, 1973. 276 p, 148 fig, 33 tab. 22 ref.

Descriptors: *Texas, *Limnology, *Rivers, Tributaries, Sampling, *Data collections, Measurement, *Benthos, *Fish, Watersheds(Basins), Water tem-"Benthos, "Fish, Watersheds (Basins), Water temperature, Hydrogen ion concentration, Chlorides, Sulfates, Nitrates, Water hardness, Organic matter, Trace elements, Bacteria, Zooplankton, Algae, Aquatic drift, Distribution patterns, Conductivity, Discharge(Water).

Identifiers: "Navasota River(Tex), "Brazos River

A general Limnological Survey was made of the Navasota River, Texas, a tributary of the Brazos River, between February, 1968 and March, 1970. Five stations on the main channel were visited twice monthly from February, 1968 to January, 1970, and three major tributaries were visited twice monthly from April, 1969 to March, 1970, at a station near the mouth of each. In addition, collections of fishes and benthos were made from 144 sites distributed throughout the watershed. Data provided include; discharge, temperature, pH, specific conductance, chloride, sulfate, nitrate, hardness, organics, trace elements, bacteria, zooplankton, macro-drift, algae, benthos and fishes (with distribution maps of fish species). W75-00558

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, METROPOLITAN AREA, 1972, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 7C. W75-00620

NEARSHORE CIRCULATIONS UNDER SEA BREEZE CONDITIONS AND WAVE-CURRENT INTERACTIONS IN THE SURF ZONE, Tetra Tech, Inc., Pasadena, Calif. For primary bibliographic entry see Field 2L. W75-00623

PROGRESS REPORT, COOPERATIVE HIGHWAY PROGRAM FOR YEAR ENDING JUNE 30, 1974, Geological Survey, Little Rock, Ark. For primary bibliographic entry see Field 8B.

THE AVAILABILITY OF WATER IN THE LIT-TLE LOST RIVER BASIN, IDAHO, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 4A. W75-00629

MODIFICATION OF ROUTED STREAMFLOW BY CHANNEL LOSS AND BASE FLOW, Geological Survey, Denver, Colo For primary bibliographic entry see Field 4A. W75-00631

LOW STREAMFLOW IN FLORIDA-MAG-NITUDE AND FREQUENCY, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W75-00633

COMPARISON OF OVERLAND FLOW Colorado State Univ., Fort Collins. Dept. of Civil For primary bibliographic entry see Field 2A. W75-00704 Engineering.

STREAMFLOW GREATLY REDUCED BY CON-VERTING DECIDUOUS HARDWOOD STANDS TO PINE, Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab. For primary bibliographic entry see Field 4D. W75-00793

STREAMFLOW REGULATION WITH PUMPED STORAGE RESERVOIRS,
Ohio Agricultural Research and Development
Center, Wooster. For primary bibliographic entry see Field 4A. W75-00796

LOW-FLOW CHARACTERISTICS STREAMS IN THE WILLAPA DRAINAGES, WASHINGTON, Geological Survey, Tacoma, Wash. M. R. Collings, and F. T. Hidaka. OF BAY

Available from NTIS, Springfield, Va 22161, PB-236 149, \$3.25 in paper copy, \$2.25 in microfiche. Water-Resources Investigations 8-74, 1974. 12 p, 4 fig, 2 tab.

Descriptors: *Low flow, *Washington, *Low-flow frequency, Frequency analysis, Flow duration, Water supply, Flow rates, Base flow. Identifiers: *Willapa Bay drainage area(Wash).

Low-flow characteristics are compiled for streams in the Willapa Bay drainage area in southwestern Washington. Generally the streams have an abundant annual supply of water. However, seasonal and areal variations in streamflow could result in water shortages where water demands for municipal, industrial, and irrigation use, and for pollution dilution and fish propagation are approaching the limits or supply during late summer and early fall. Annual precipitation averages 95 inches over the basin and ranges areally from about 80 to 120 inches. About 75% of the precipitation occurs during October-March, mostly as rain. Streamflow during the low-flow period is mostly from groundwater discharge. Yearly variations of 7-day low flows, for the Naselle River near Naselle, ranged from about 20 cubic feet per second in 1968 to about 65 cubic feet per second in 1955. Low-flow-frequency curves were plotted at nine continuous-recording stations having 10 or more years of record. Correlation techniques were used to estimate low-flow frequencies for stations with less than 10 years of record. The low-flow-frequency data for 7-day low flows at 60 sites are shown on a map. (Knapp-USGS) W75-00804

THE RELATION OF RAINFALL NETWORK DENSITY TO ACCURACY OF RUNOFF PREDICTION IN A MOUNTAINOUS BASIN, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 7A. W75-00807

HYDRAULICS AND HYDROLOGY GLACIERS, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2C.

WATER FLOW THROUGH A TEMPERATE GLACIER, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2C.

PERIODIC TEMPERATURE INSTABILITIES IN SUB-POLAR GLACIERS, British Columbia Univ., Vancouver. Dept. of Geophysics. For primary bibliographic entry see Field 2C. W75-00840

TYPES OF BREAKUP OF RIVERS IN SIBERIAN ARCTIC AND SUB-ARCTIC ZONES, Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR). V. S. Antonov, V. V. Ivanov, and Yu. V. Nalimov. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 541-546, 1973. I fig.

Descriptors: *Ice breakup, *Rivers, *Arctic, Floods, Ice cover, Thawing, Melting, Channel norphology.
Identifiers: *USSR(Siberia).

Aerial observations of breakup of ice in rivers of the Siberian Arctic and Subarctic zones during spring and data obtained from permanent station networks make it possible to classify rivers according to their breakup pattern. The dynamic effect of the downstream flood wave in rivers flowing from south to north plays an important role in the process of spring breakup. Breakup patterns and their major causes are discussed. The types of breakup are shown by a chart. (See also W75-00809) (Knappa-USGS) W75-00847

HYDRAULIC METHOD FOR EVALUATION OF ICE-GORGES ON RIVERS, Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). B. V. Proskuryakiv, and V. P. Berdennikov

B. V. Proskuryakiv, and V. P. Berdennikov. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 547-556, 1973. 4 fig, 5 ref.

Descriptors: *Ice jams, *Rivers, Floods, Data collections, Ice breakup, Stage-discharge relations, Backwater, Channel morphology.

Identifiers: USSR.

Measurements of thickness of ice jams are facilitated by computations based on the data or morphology of river stretches and on detailed information about water levels during ice jams. A method for hydraulic computation of river stream elements under conditions of steady and unsteady regimes is based on usage of nomograms. This method was improved and used for evaluation ice jam thickness at a number of rivers in the USSR. Comparison of the results with data based on field observations proved the feasibility of the method for practical purposes. (See also W75-00809) (Knapp-USGS) W75-00848

FIELD EXPERIMENTS OF WINTER FLOW IN NATURAL RIVERS, Canada Centre for Inland Waters, Burlington

Canada Centre for Inland Waters, Burlington (Ontario).

G. Tsang, and L. Szucs.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September

Proceedings of Band Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 772-796, 1973. 10 fig. 1 tab, 12 ref.

Descriptors: *Streamflow, *Ice cover, *Stagedischarge relations, Channel morphology, Scour, Freezing, Ice breakup, Frazil ice.

The reactions of a natural watercourse to the effects of ice cover formation, growth, and deterioration are described. The study, which spanned two winters, undertook a systematic approach to collecting various types of data in an effort to determine some of the parameters that affect rivers in cold weather. Observations were made of stage, velocity distributions, and riverbed erosion, both with and without ice cover. In addition, the phenomena of ice cover formation, deterioration, and the behavior of frazil ice were noted. (See also W75-00809) (Knapp-USGS)

MEASUREMENT OF DISCHARGE UNDER ICE COVER.

Water Survey of Canada, Winnipeg (Manitoba). For primary bibliographic entry see Field 7B. W75-00870

SNOWMELT RUNOFF FORECASTS-THEORETICAL PROBLEMS, Hydrometeorological Service of the USSR, Moscow. For primary bibliographic entry see Field 4A. W75-00872 TECHNIQUES FOR PREDICTING SNOW COVER RUNOFF, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 4A.

DIFFERENCES IN VOLUME OF SURFACE RUNOFF DURING THE SNOWMELT PERIOD: YELLOWKNIFE, NORTHWEST TERRITORIES, Alberta Univ., Edmonton. Dept. of Geography.

Alberta Univ., Edmonton. Dept. of Geography. A. L. Landals, and D. Gill.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 927-942, 1973. 3 fig, 4 tab, 12 ref.

The environmental factors that initiate differences in the volume and timing of snowmelt runoff in a subarctic region are described. Discharge data measured during three field seasons indicate that although surplus water from snowmelt is annually available from surface runoff from each of the contrasting environments studied, the pattern of discharge may vary considerably. The factors most important in determining the volume and timing of spring runoff are: (1) the varying amounts of storage afforded by exposed bedrock and mineral-organic surface materials; and (2) the amount of water restored to this material the previous autumn by rain that immediately precedes active-layer freezeback. (See also W75-00809) (Knapp-USGS)

FORECASTING RUNOFF; OPERATIONAL PRACTICES, British Columbia Univ. (Vancouver).

British Columbia Univ. (Vancouver). For primary bibliographic entry see Field 4A. W75-00879

W75-00881

MATHEMATICAL MODEL OF SPRING FLOOD FORMATION AND POSSIBILITIES OF ITS USE FOR SHORT-RANGE FORECASTING, Hydrometeorological Service of the USSR, Moscow. For primary bibliographic entry see Field 4A.

APPLICATION OF A PARAMETRIC MODEL FOR ESTIMATING SNOW ACCUMULATION AND FLOW FORECASTING, Waterloo Univ. (Ontario). For primary bibliographic entry see Field 2C.

NEW TECHNIQUES IN FORECASTING RU-NOFF FROM SNOW, Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-00888

SNOWMELT RUNOFF INVESTIGATIONS FOR DEVELOPING FORECAST METHODS, Hydrometeorological Service of the USSR, Moscow. For primary bibliographic entry see Field 4A. W75-00891

EFFECT OF SNOW AND ICE ON RUNOFF AT MOUNT RAINIER, WASHINGTON, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2C. W75-00899

Group 2E-Streamflow and Runoff

FLOOD PLAIN INFORMATION: FOX RIVER -LAKE WINNEBAGO, CITY OF OSHKOSH, WINNEBAGO COUNTY, WISCONSIN. Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 4A. W75-00989

FLOOD PLAIN INFORMATION, CLEAR FORK AND ELK CREEK, JELLICO, TENNESSEE. Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00990

FLOOD PLAIN INFORMATION, MILL CREEK, SEVEN MILE CREEK, NASHVILLE, TENNES-

Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00991

FLOOD PLAIN INFORMATION. CUMBER-LAND RIVER, POOR, CLOVER AND MARTINS FORKS, AND CATRON CREEK, HARLAN, KENTUCKY. Army Engineer District, Nashville, Tenn.

For primary bibliographic entry see Field 4A. W75-00992

FLOOD PLAIN INFORMATION, CUMBER-LAND RIVER, RICHLAND AND FIGHTING CREEKS, BARBOURVILLE, KENTUCKY. Army Engineer District, Nashville. Tenn. For primary bibliographic entry see Field 4A. W75-00993

FLOOD PLAIN INFORMATION, LITTLE BUSHKILL CREEK, AND SHOENECK CREEK, NORTHAMPTON COUNTY, PENNSYLVANIA. Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 4A. W75-00994

FLOOD PLAIN INFORMATION, CRUM CREEK, DELAWARE COUNTY, PENNSYL-

Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 4A. W75-00995

FLOOD PLAIN INFORMATION: MEN-DENHALL RIVER, JUNEAU, ALASKA. Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W75-00996

FLOOD PLAIN INFORMATION, POOR FORK, CLOVERLICK CREEK AND LOONEY CREEK, CUMBERLAND, KENTUCKY. Army Engineer District, Nashville, Tenn.

For primary bibliographic entry see Field 4A. W75-00997

2F. Groundwater

HYDROGEOLOGY OF WETLANDS IN MAS-SACHUSETTS, Massachusetts Univ., Amherst. Dept. of Geology

and Geography.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 445, PC \$6.25, MF \$2.25. M Sc Thesis, August 1973. 129 p, 2 fig, 2 tab, 60 ref, 4 append. OWRT-B-023-MASS(6). 14-31-0001-3596.

Descriptors: *Wetlands, *Hydrogeology, *Massachusetts, *Northeast US, Freshwater, Sur-*Hydrogeology. face waters, Regions, Geologic mapping, Groundwater, Hydrology, Water resources, Geographical regions. Geology Identifiers: *Surficial geology.

Results were presented of a broad study of the relationship of freshwater wetlands to hydrogeology throughout Massachusetts. The distribution and character of wetlands which occupy about 327,000 acres or 6.5% of the state's land area are related to eight physiographic regions, indicating the strong influence of surficial geology. Wetlands, an integral part of the hydrologic system, store large quantities of water which are released to streams, aquifers, and the atmosphere. Wetlands underlain thick deposits of stratified drift are generally the most favorable ones for groundwater supply; those underlain by alluvium or lake-bottom those underlain by alluvium or lake-bottom deposits are locally good sources of large ground-water supplies; and those underlain by till, bedrock, and other deposits are not generally favorable for groundwater supply. Groundwater associated with wetlands has high iron and manganese contents. A surficial geologic map and a freshwater wetland map were included. (Humphreys-ISWS)

HYDROGEOLOGIC ASPECTS OF STRUC-TURAL DEFORMATION IN THE NORTHERN GULF OF MEXICO BASIN,

Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.

P. H. Jones, and R. H. Wallace, Jr.

In: Structure of the Gulf Basin; Part I of Proceedings of Seminar, New Orleans, Louisiana, May 22-24, 1973: New Orleans Geological Survey Continuing Education Committee Publication, p 89-115, 1973. 13 fig, 12 ref.

Descriptors: *Hydrogeology, *Structural geology, *Sedimentation, *Gulf Coastal Plain, *Pore pressure, Pore water, Subsidence, Faults(Geologic) Deformation, Continental margin, Continental Shelf, Continental slope, Sedimentary structures.

Resistance of unconsolidated clastic sediments to structural deformation is an inverse function of water content and pore pressure and has no uniform relation to depth of burial in the Gulf of Mexico basin. Deposited rapidly along the northwestern margin of the Gulf Coast geosyncline, younger sediments have buried older ones deeply before they could drain properly in response to compaction stress of overburden load. Contemporaneous gravity faults of major dimension occur along gulfward margins of delta-front sand bodies, reflecting the effect of sediment fa-cies distribution on structure. Sand bodies are more stable than shale masses. Such contemporaneous or growth faults are a most distinctive feature of the geology of the Gulf of Mexico basin; they are normal faults with progressive increase in throw with depth and, across which, from upthrown to downthrown block, correlative section thickens greatly. In plan and profile, faulted masses resemble landslides; fault planes are concave gulfward and upward, the dip decreasing with depth. Fault movement rotates the block, causing reversal of dip of beds in the block and sealing the landward ends of included aquifers to discharge of mandward ends of included adulters to discharge of waters of compaction. This proves geopressured conditions so common in the Gulf Coastal Plain and Continental Shelf. Early development of geopressure in the block reduces resistance to shear, and progressive landward side loading of the block sustains rotational stress. Geopressured water flowing into the fault zone-the easiest escape route--reduces drag and facilitates movement on the fault. (Knapp-USGS) W75-00618

SELECTED WATER-LEVEL RECORDS FOR COLORAD WATER-LEVEL RECORDS COLORADO, 1970-74. Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 7C. W75-00619

GROUND-WATER LEVELS IN NEW MEXICO, 1970, AND CHANGES IN WATER LEVELS, Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 4B. W75-00624

WORTH OF ADDITIONAL DATA TO A DIGITAL COMPUTER MODEL OF A GROUND-

Geological Survey, El Paso, Tex. J. S. Gates, and C. C. Kisiel. Water Resources Research, Vol 10, No 5, p 1031-1038, October 1974. 3 tab, 14 ref.

Descriptors: *Data collections, *Mathematical models, *Arizona, *Groundwater basins, Economics, Hydrologic data, Planning, Water balance, Water yield. Identifiers: *Tucson(Ariz).

The worth of additional data to a digital model of the Tucson basin, Arizona, was computed by using a basic form of statistical decision theory. The variables for which additional data were hypothesized included the aquifer coefficients of storage and transmissivity, initial water levels, discharge, and recharge. The worth of data was evaluated in terms of the expected reduction in error in predicted water levels associated with collection of more data on one variable at one point in the model. The Tucson basin model could be improved most by obtaining more data on discharge and recharge in areas where these variables were large and by obtaining more data on transmissivity where it was uncertain. More data on initial water levels and storage coefficient commonly were less helpful. The sensitivity of the results to the as-sumptions made in postulating discrete frequency distributions with largely subjectively determined parameters for the model variables was estimated. The numerical values for worth of data were sensitive to the assumption but the relative rankings of variables in terms of worth of added data remained constant. (Knapp-USGS) W75-00630

AN INDEX TO SPRINGS OF FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W75-00632

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN EAST CENTRAL FLORIDA, MAY 1974, Geological Survey, Winter Park, Fla. For primary bibliographic entry see Field 7C. W75-00635

GROUND WATER IN PERSPECTIVE, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W75-00640

TEMPORARY STORAGE OF FRESH WATER IN A SALINE AQUIFER BY USE OF WELLS-A FIELD EXPERIMENT, Geological Survey, Winter Park, Fla. For primary bibliographic entry see Field 4B.

THE RELATIONSHIP BETWEEN LITHOLOGY AND TRACE-ELEMENT CONTENT OF GROUND WATER,

Geological Survey, Rolla, Mo. Water Resources In: Short Papers of the Eighth American Water Resources Conference, St Louis, Missouri, October 30-November 2, 1972: American Water Resources Association Proceedings Series No 16, p 104, 1972. 1 tab, 3 ref.

Groundwater—Group 2F

Descriptors: *Water chemistry, *Groundwater, *Missouri, *Trace elements, Leaching, Solutes, Dolomite, Sandstones, Limestones, Shales, Coals, Oxidation-reduction Hydrogen ion concentration.

Geochemical studies being conducted in Missouri demonstrate that different areas of the State are distinctive in their trace-element content in both bedrock and groundwater. Volumetrically, the three more important bedrock units are: (1) strata of Pennsylvanian age, (2) strata of Mississippian age, and (3) strata of Cambrian and Ordovician age. The strata of Pennsylvania age consist of shales, sandstones, and limestones, with some beds of coal. Most of the groundwater obtained from strata of Pennsylvania age is from sandstone, although contact with the limestones, shales, and coals strongly affects the chemistry of the water. The strata of Mississippian age are predominantly limestones, while the strata of Cambrian and Ordovician are predominantly dolomites. Ground-waters from the Pennsylvanian argillaceous rocks are clearly distinct from those in the pre-Pennsylvanian calcareous rocks in most trace elements. Some trace elements, notably zinc, do not show a relationship between abundance in rock and abundance in groundwater. Even though the Pennsylvanian-age strata have an appreciably higher concentration of zinc than strata of Cambrian and Ordovician age, the groundwaters in the Pennsylvanian strata are lower in zinc. Evidently, the low Eh and the presence of H2S in the groundwater of the Pennsylvanian strata sharply reduces the solubility of zinc in comparison to its solubility in the relatively high Eh waters in the Cambrian and Ordovician strata. (Knapp-USGS)

THE RISING WATER TABLE IN THE WEST NUBARYA AREA OF EGYPT, International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands).
For primary bibliographic entry see Field 4B.
W75-00665

ANALYSIS OF UNSTEADY FLOW TOWARD ARTESIAN WELLS BY THREE-DIMENSIONAL FINITE ELEMENTS,

Kentucky Water Resources Research Inst., Lex-

ington. Y. H. Huang, and S-J. Wu.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 925, \$6.25 in paper copy, \$2.25 in microfiche. Research Report No 75, August 1974. 164 p. 29 fig. 2 tab, 14 ref. append. OWRT A-042-KY(1). 14-31-0001-3517, 14-31-0001-3817, and 14-31-0001-4017.

Anisotropy, *Anes....*
*Computer **Computer programs, *Computer models, Aquifers, Digital computers, Drawdown, *Finite element analysis, Groundwater, Heterogeneity, Numerical analysis, *Unsteady flow.

A three-dimensional finite element computer program was developed for analyzing unsteady flow toward artesian wells. The program is designed especially for determining the drawdown around an artesian well penetrating fully or partially a nonhomogeneous and anisotropic aquifer and irregular beauty of the program of the p regular shape and cross section. It can also be used as a general program for aquifer simulation and evaluation. A major advantage of the program lies in the minimum amount of input data required. By assuming the top and bottom boundaries of the aquifer as two arbitrary planes, the aquifer will be divided into six- or eight-node elements, and their nodal coordinates generated automatically. The program was well documented and can be used for solving complex problems encountered in practice. Results indicate that unsteady flow toward ar-tesian wells can be analyzed effectively by three-dimensional finite elements. A comparison between the finite element and the exact mathematical solutions for a simple case shows that both

solutions check closely. The solution obtained from the computer program for a complex case involving a nonhomogeneous aquifer was checked against that obtained previously by the use of cylindrical elements, and both are found in good agreement. The program was applied to a variety of cases, and reasonable results were obtained. (Grieves-Kentucky) W75-00693

HYDROGRAPH ANALYSIS OF CARBONATE

AQUIFERS, Pennsylvania State Univ., University Park. Materials Research Lab. For primary bibliographic entry see Field 3B.

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGEMENT, VOLUME I: DEVELOPMENT THE GROUND WATER QUALITY MODEL, California State Dept. of Water Resources, Sacra-

A. A. Hassan, D. C. Kleinecke, S. J. Johanson,

and C. E. Pierchala.

Available from the National Technical Informa-Nation Service, Springfield, Va 22161 as PB-237 371, \$7.25 in paper copy, \$2.25 in microfiche. District Report, August 1974. 191 p, 34 fig, 17 tab, 30 ref, 4 append. OWRT C-3117(3733)(1). 14-31-0001-3733.

Descriptors: *Dissolved solids, *Groundwater movement, Aquifers, *Groundwater basins, Dispersion, *Salts, *California, *Computer programs, Mixing, *Model studies, Computer models, *Saline water intrusion, Water utilization, *Mathematical models, Water quality, Manage-

Identifiers: *Santa Clara-Calleguas groundwater quality model(Calif), Ventura County(Calif).

A digital computer program was developed to estimate the concentration of total dissolved solids of extracted water from a multiaquifer ground water basin. The model considered salt input from natural sources and from man's uses of water: domestic, industrial, and agricultural. The computer system was tested in the Santa Clara-Calleguas area in Ventura County, California. (See also W75-00703) W75-00702

MATHEMATICAL MODELING OF WATER MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAG-MENT, VOLUME II: DEVELOPMENT OF HISTORIC DATA FOR THE VERIFICATION OF THE GROUND WATER QUALITY MODEL OF THE SANTA CLARA-CALLEGUAS AREA, VENTURA COUNTY, California State Dept. of Water Resources, Sacra-

mento.

A. A. Hassan, D. C. Kleinecke, S. J. Johanson,

and C. E. Pierchala.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 372, \$5.75 in paper copy, \$2.25 in microfiche. District Report, August 1974. 119 p, 35 fig, 25 tab, 25 ref. OWRT C-3117(3733)(1).

Descriptors: "California, "Dissolved solids, "Groundwater movement, "Water quality, Model studies, Aquifers, "Mathematical models, Management, Data collections, "Saline water intrusion, "Chlorides, Percolation, Water levels. Identifiers: "Santa Clara-Calleguas groundwater quality model(Calif), Ventura County(Calif).

Based on the evaluation of total dissolved solids in wells of different depths, vertical variation of quality was found to be insignificant in the Santa Clara-Calleguas area, except in the Oxnard Plain area which has three separate aquifer systems. In the Oxnard Plain area, the shallow perched aquifer was not goodled in either the quantity or quality was not modeled in either the quantity or quality model. Leakage from the perched aquifer served

as an input to the upper layer nodes of the model. The Oxnard-Mugu aquifer system and the Hueneme, Fox Canyon, and Grimes Canyon system were modeled as separate layers of specific water quality values. The following are the main conclusions of the sea-water intrusion study: (1) Based on the fluctuations of ground water levels and chloride concentrations in well water, it was possible to construct cross sections showing the sequential advance inland of the seawater front into the Oxnard aquifer. (2) Generally, chloride concentrations increased as water levels declined. (3) Sufficient data were available in the Port Hueneme area to relate the inland advance of sea water into the Oxnard aquifer to the decline in water levels. Data were insufficient to develop the same relationship in the Point Mugu area. (4) Increase in the chloride concentration of ground water in the Point Mugu area may be due to sea-water intrusion and also to percolation of saline water from the ground surface. (See also W75-W75-00703

TESTS OF A GROUNDWATER OPTIMIZATION TECHNIQUE, Stanford Univ., Calif. Dept. of Geology

For primary bibliographic entry see Field 4B.

GROUND-WATER MODELLING USING IN-TERACTIVE ANALOGUE AND DIGITAL COM-

Birmingham Univ. (England). Dept. of Civil Engineering.

K. R. Rushton, and J. E. Ash. Ground Water, Vol 12, No 5, p 296-300, September-October 1974. 5 fig, 2 tab, 6 ref.

Descriptors: *Analog models, *Digital computers, *Groundwater movement, Saline water intrusion, Aquifers, Water levels, Groundwater aquifer characteristics, Computer models, Resistance net-

Identifiers: *United Kingdom(Lincolnshire Limestone Aquifer-Eng), Resistance-capacitance

When modelling the long-term behavior of an aquifer, a resistance-capacitance model controlled by a mini digital computer can be used with advantage. In the system presented, the resistancecapacitance network modelled time as a continu-ous function, while the digital computer both controlled the complex input-ouput pattern and recorded voltages (heads). The technique was ap-plied to the Lincolnshire Limestone Aquifer in eastern England which is inconfined in the west and vonfined in the east, the problem was to pre-dict minimum water levels and saline intrusion in the aquifer over a 100-year period, given the aquifer properties, recharge, river flow, and proposed pumpage scheme. The results for the unconfined region showed a slow, steady decrease in the levels, indicating dewatering. Seasonal varia-tions were superimposed on this water level decline. A similar gradual fall in water level was predicted in the confined region. Although this decline was not enough to cause dewatering in the confined region, the fall did cause a reversal in the gradient to the east of the aquifer with a resultant inflow of saline water. (Visocky-ISWS)

THE FUTURE OF GROUNDWATER RESOURCES IN DUPAGE COUNTY,
Illinois State Water Survey, Warrenville. Hydrolo-

gy Section. R. T. Sasman.

Ground Water, Vol 12, No 5, p 277-282, September-October 1974. 3 fig, 1 tab, 8 ref.

Descriptors: *Groundwater resources, *Aquifer systems, Groundwater mining, Artificial recharge, Diversion, Demineralization, Imported water,

Group 2F—Groundwater

*Illinois, Dolomite, Sandstones, Water supply, Glacial drift, Aquifers, Wells, Mining, Groundwater, Lake Michigan, *Water demand. Identifiers: *DuPage County(III), Deep sandstone aquifer, Mt. Simon Sandstone, Potential yield, Practical sustained yield.

DuPage County, one of the major counties of the Chicago metropolitan area, obtains all of its water supply from groundwater resources. In 1972, pumpage was 56.6 mgd, 18% more than the combined potential yield of shallow aquifers and the practical sustained yield of deep aquifers. Total pumpage from shallow aquifers almost equals the tial yield. In some areas, yields of shallow wells have declined drastically as a result of excessively heavy pumpage. Pumpage from deep aquifers is more than double the practical sustained yield. Demands for water are projected to increase more than 250% by the year 2020. Alternative methods of developing supplies to meet the anticipated demands include artificial recharge of shallow and/or deep aquifers, mining of deep aquifers, increased diversion of water from Lake Michigan, demineralizing Mt. Simon sandstone water, and importation of underdeveloped surface or groundwater resources in north central and northwestern Illinois. (Visocky-ISWS) W75-00748

A METHODOLOGY FOR THE RAPID EVALUATION OF GROUNDWATER RESOURCES, SAO PAULO STATE, BRAZIL, Tahal Consulting Engineers Ltd., Tel Aviv For primary bibliographic entry see Field 4B. W75-00761

THE EFFECT OF SURFACE DRAINAGE ON WATER TABLE RESPONSE TO RAINFALL. North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Soil Science. For primary bibliographic entry see Field 2A. W75-00786

NONSTEADY FLOW TO A LARGE WELL IN A NONSTEADT FLOW TO A LARGE WELL IN A LEAKY AQUIFER,
Wisconsin Univ., Milwaukee. Coll. of Applied Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-00795

GROUNDWATER IN THE ALLUVIUM ALONG THE GREEN RIVER BETWEEN ITS MOUTH AND WOODBURY, KENTUCKY, Geological Survey, Louisville, Ky. For primary bibliographic entry see Field 7C. W75-00806

WATER PERCOLATION THROUGH HOMOGENEOUS SNOW, Cold Regions Research and Engineering Lab., THROUGH Hanover, N.H. For primary bibliographic entry see Field 2C. W75-00826

HYDRAULICS AND HYDROLOGY GLACIERS. Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2C. W75-00833

2G. Water In Soils

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W75-00764

PERMEABILITY OF UNSATURATED FIELD SOILS CALCULATED FROM LABORATORY DESATURATION DATA, Florida Univ., Sanford. Agricultural Research and

Education Center. .. R. Sinclair, D. W. Fitzsimmons, and G. L.

Bloomsburg.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 399-405, May-June 1974. 11 fig, 1 tab, 26 ref.

Descriptors: *Porous media, *Permeability, *Unsaturated flow, *Laboratory tests, Soil water, Capillary water, Soils, Agriculture, Soil tests, Hydraulic conductivity, Pervious soils, Pores, Soil water movement, Porosity, Testing procedures.

A method of calculating the permeability of par-tially saturated field soils from experimentally determined capillary pressure head-saturation relationships was developed. The method involved relationships was developed. The method involved the use of a Burdine-type equation to calculate the relative permeability values which were expressed as a function of average values of the square of the pore radius calculated from the pore-size distribution of the soil using a statistical approach. The pore-size distribution was determined from the pore-size distribution was determined from the capillary pressure head-saturation relationship for the soil. The method was evaluated by comparing experimental capillary pressure head-permeability relationships for seven soils with similar relation-ships calculated from experimentally determined capillary pressure head-saturation relationships. ese comparisons were made with relationships These comparisons were made with relationships obtained for both disturbed and undisturbed samples of each soil. In general, the calculated relationships compared favorably with the experimentally determined relationships. Very close agreement was found between experimental and calculated capillary pressure head-perimeability relationships when the data were scaled by dividing tionships when the data were scaled by dividing permeability and capillary pressure head values by the saturated permeability and bubbling pressure head of the soil, respectively. When the data were scaled in this way, the capillary pressure head-permeability relationships calculated for both undisturbed and disturbed samples of a soil were essentially the same. (Humphreys-ISWS) W75-00789

ESTIMATED PERMEABILITIES FOR SOILS IN THE SACRAMENTO VALLEY, CALIFORNIA, Geological Survey, Menlo Park, Calif. G. L. Bertoldi. Available from NTIS, Springfield, Va 22161 as PR.236 242 \$325 in paper copy \$225 in

PB-236 242, \$3.25 in paper copy, \$2.25 in microfiche. Water-Resources Investigations 51-73, May 1974. 17 p, 3 fig, 1 tab, 23 ref, append.

Descriptors: *Permeability, *Hydraulic conductivity, *Infiltration, *California, Soil water movement, Soil surveys, Maps. Identifiers: *Sacramento Valley(Calif).

About 50 percent of the Sacramento Valley area of percent of the area. (Knapp-USGS) W75-00805

INFILTRATION OF SNOWMELT WATER INTO

FROZEN SOIL, Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 2C. W75-00830

SOIL MOISTURE IN ALPINE MOUNTAIN SLOPES OF COLORADO AND NEW MEXICO, Vrije Universiteit, (Netherlands). Inst. of Earth Sciences.

G. B. Engelen. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 342-352, 1973. 4

Descriptors: *Soil moisture, *Mountains, *Colorado, *New Mexico, Variability, Statistics, Slopes, Alpine, Altitude, Field capacity, Moisture

Soil moisture data from 43 stations in the mountain soli moisture data from 4) stations in the mountain slopes of Colorado and New Mexico, at elevations between 8,000 and 12,000 feet, were studied. The data were obtained from buried resistance blocks during the fall, March, April, and May of each year for periods of 10-17 years. No relation was found between fluctuation patterns and slope angle or soil type. A net increase in soil moisture between fall and May was found at 95% of the sta-tions. A net decrease of the coefficient of variation between fall and May was found at 86% of the sta-tions. The soil moisture amounts in springtime are greater in Colorado than in New Mexico and vary less from year to year. None of the observed sta-tions are fully saturated or even at field capacity as a mean condition. A few stations occasion reach their field capacity in wet years. (See also W75-00809) (Knapp-USGS) W75-00832

TWO-YEAR CYCLES IN SOIL MOISTURE RECHARGE, SNOWPACK, AND STREAMFLOW IN RELATION TO ATMOSPHERIC CONDITIONS, (WITH SPECIAL REFERENCE TO THE UPPER COLORADO RIVER BASIN), Vrije Universiteit, A Universiteit, Amsterdam (Netherlands). For primary bibliographic entry see Field 2A.

COMPARISON OF CURRENT CHEMICAL METHODS FOR EVALUATING IRRIGATION

Commonwealth Scientific and Industrial Research Organization, Canberra, (Australia). J. Loveday, H. J. Beatty, and J. M. Norris. Available from the National Technical Information Service, Springfield, Va 22161, as PB-215 000, \$3.25 in paper copy, \$2.25 in microfiche. Division of Soils Technical Paper No 14, 1972. 19 p, 6 fig, 10 tab. 14 ref.

Descriptors: *Soils, *Soil physical properties, *Irrigation, Salinity, *Soil chemical properties, Soil classification, Soil properties, Irrigation profiles, Soil types, Soil tests.

Fifty soil samples from 20 profiles were analyzed for pH, electrical conductivity, chlorides, soluble sodium, exchangeable cations, and other soluble and total solute concentrations. These soils were classified by numerical techniques on four sets of classified by numerical techniques on four sets of data involving exchangeable cations by both saturation extract data and total cations by ammonium chloride extraction. The resulting soil groups are compared to established reference standards determined with respect to suitability to irrigation, with the result that preference is given to a method involving the determination of exchangeable cations by extraction with molar ammonium chloride in 60 percent ethanol following a pretreatment with 10 percent ethylene glycol in 96 percent ethanol. (Muller-Arizona)
W75-01027 W75-01027

CHANGES IN THE CONTENTS OF CALCIUM LACTATE SOLUBLE POTASSIUM AND PHOSPHORUS IN UNTILLED AND TILLED SOILS DURING A GROWTH PERIOD, (IN GER-

Goettingen Univ. (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung. For primary bibliographic entry see Field 3F. W75-01047

Lakes-Group 2H

THE INFLUENCING OF AGGREGATE STA-BILITY, PLASTICITY AND WATER RETEN-TION IN SOIL STABILIZATION WITH MEDI-UM AND HIGH APPLICATIONS OF CALCIUM HYDROXIDE, (IN GERMAN), W. Czertzki.

Z Pflanzenernaehr Bodenkd. Vol 133, No 1/2, p

45-53, 1972, Illus. English summary.
Identifiers: Aggregates, *Calcium hydroxide,
*Plasticity, *Soil stability, Water retention(Soils),

Model experiments were conducted to evaluate the effects of Ca(OH)2 on soil stabilization. The interaction between these effects and the rate of application and the duration of reaction were investigated with regard to aggregate stability by wet sieving, plasticity and water retention at different soil suctions. Aggregate stability as measured by wet sieving of aggregates 0.2--2.0 mm increased at high application rates of Ca(OH)2 (1--7%). In one case after 1 vr storage an increase of aggregate stability was found as compared with 28 days storage. Water retention at low soil suctions increased by the application of 0.1--0.5% Ca(OH)2 but substantitally decreased by application of 1--7%. The application of Ca(OH)2 caused a dislocation of soil plasticity towards higher soil water contents. At equal storage times the effects in the 1--7% treatments were similar in all soils. The decrease in water retention at low water suctions in connec-tion with the dislocation of soil plasticity towards higher soil water contents excludes, at the application rates of 3--7% Ca(OH)2, plastic conditions in stabilized soils.--Copyright 1974, Biological Abstracts, Inc. W75-01048

SPRINKLER-INDUCED SOIL TEMPERATURE CHANGES UNDER PLANT COVER, Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center For primary bibliographic entry see Field 3F. W75-01054

DRAINAGE EXPERIMENTS ON PEAT SOIL IN VESTERALEN, (IN NORWEGIAN), Statens Forsocksgard Vagoenes, (Norway). For primary bibliographic entry see Field 3C. W75-01057

CLEAN CULTIVATION AND THE ESTABLISH-MENT OF PINUS KESIYA IN ZAMBIA For primary bibliographic entry see Field 2I. W75-01070

INITIAL RESULTS OF TWO DRAINAGE EX-PERIMENTS WITH PLANTATION OF CONIFERS, (IN FRENCH), Cent. Natl. Rech. For., Einville, Fr. Inst. Natl. Rech. Agron. Centre National de Recherches

Forestieres, Einville-au-Jard (France). Station de Recherches Sur les Sols Forestiers et la Fertilisa-

For primary bibliographic entry see Field 2I. W75-01071

AGRICULTURAL TECHNIQUES OF RAISING GREENERY PLANTATIONS UNDER THE CONDITIONS OF NORTHERN KAZAKHSTAN, (IN RUSSIAN), G. M. Mordvintsev.

Tr Kaz Nauchno-Issled Inst Lesn Khoz, 7, p 157-

Descriptors: *Soil moisture, Trees, Mulching, Ir-Identifiers: Betula verrucosa, Populus balsamifera, *USSR.

Three planting methods were tried (in the USSR) of saplings planted into a slit by means of a recon-

structed 'SLN' machine without irrigation; planting into holes prepared with a 'KPYa-100' hole digger without irrigation and planting into holes with a 2-fold irrigation (the control). The highest survival and the highest increment were recorded in the control. However, with planting of saplings into a slit the conditions for the growth of poplar saplings proved to be more favorable than planting into holes. Soil humidity in the variant with the saplings planted into a slit proved to be somewhat higher than that in holes. The best time for Populus balsamifera saplings is in fall, whereas for Betula verrucosa saplings, planting in spring is best. The study of the effect of heteroauxin (a potassium salt of IAA) on root formation in B. verrucosa saplings revealed its positive action. The most effective proved to be the application of a 2-fold irrigation saplings with the stimulant solution in a 15 mg/liter concentration. Trimming of birch sapling crowns increased their survival rate and growth. Best results were obtained with the trimming of crowns by 50%. The testing of different mulching materials showed the advantage of these materials as compared with soil loosening, with the excep-tion of the variant with the mixing of the upper soil layer with sawdust .-- Copyright 1974. Biological Abstracts, Inc. W75-01072

THE VARIABILITY OF PHYSICAL PROPERTIES OF SOIL WITHIN THE FOREST-STEPPE OAK-GROVE, (IN RUSSIAN), O. G. Rastvorova, and V. V. Podalinskaya.

Vestn Leningr Univ Ser Biol, Vol 28, No 2, p 112-122, 1973, Illus, English summary.

Descriptors: *Soil physical properties, Humus, Forests, Organic matter, *Forest soils, *Oak trees.

The study of distributional heterogeneity of various properties of soil includes the following: quantitative analysis of the extent of this heterogeneity; discovery and classification of its source and form; and development of appropriate methods of study of the distributional heterogeneity of soil properties and factors, their determination, and their relationships. The degree of distributional heterogeneity for a series of physical indices (weight by volume, specific gravity, hygroscopici-ty, maximal hygroscopicity, least water capacity) of dark-gray forest medium-podzolic agrillaceous soils in the forest-steppe oak grove was studied. Dependence of the variation in these physical indices on humus content was associated with the nature of the pore distribution (weight by volume and least water capacity) and, indirectly, through the degree of structure, was also associated with organic matter. A decrease in humus content was reflected in a marked decrease in the variation of the specific gravity since the change in specific gravity in relation to the presence of humus occurred in proportion to the weight percent of the latter, and not in proportion to the surface, as in the case of hygroscopicity. With regard to the variation in the number of particles of clay, the heterogeneity in the cross-section of fine-grained fractions related to the eluvial process appeared to be more important than the content of organic matter. A purely statistical index-coefficient of variation of physical properties of soil appeared to be as closely related to the genetic properties of the soil as to these physical properties.—Copyright 1974, Biological Abstracts, Inc. W75-01097

THE PROTECTIVE FUNCTION OF FORESTS AND FUNCTIONAL MANAGEMENT OF THE FOREST SUBSTRATE, (IN FRENCH), Institutul de Studii st Profectari Forestiere,

Bucharest (Rumania). For primary bibliographic entry see Field 4A. W75-01098

EFFECT OF WATER-SUPPLY IRRIGATION OF MICROFLORA AND ENZYMATIC ACTIVITY

OF DARK CHESTNUT SOIL IN SOUTHERN UKRAINE,

Ukrainskii Nauchno-Issledovatelskii Oroshaemogo Zemledeliya, Kherson (USSR). H. O. Iutynska.

Mikrobiol Zh (Kiev), Vol 35, No 4, p 429-432, 1973, English summary.

Descriptors: *Irrigation effects, Soil microbiology. Identifiers: Catalase, Phosphatase, *Chestnut soils, *USSR(Ukraine).

Seven days after irrigation an inhibition was observed in the development of microflora and enzymic processes in the soil. The maximum activity in the microbiological processes was observed 14 days after irrigation. In the areas with a higher norm of applied fertilizers a decrease was found in the catalase and phosphatase activities of the soil after irrigation.--Copyright 1974, Biological Abstracts, Inc. W75-01099

PEAT LANDS OF THE TATRA MOUNTAINS. (IN POLISH).

Polskie Towarzystwo Przyrodniko im Kopernika, Krakow. A. Obidowicz.

Wszechswiat, 6, p 157-159, 1973, Illus.

Descriptors: *Peat, Soil types. Genes. Identifiers: Tatra Mountains. *Czechoslovakia(Tatra region).

Two factors are decisive for distribution of peat lands: climate and local relief including type of bedrock. The Tatra region (Czechoslovakia) possesses, to some extent, favorable conditions for peat formation and shows a certain regularity in the distribution, magnitude, ganesis and floristic types of the peat lands existing there. Three types of peat lands can be distinguished in this region: high, low and transitional. Depth of the peat sediments varies from some 20-30 cm to 5.8 m. A number of interesting plant species are to be found growing on these lands. The Tatra peat lands are of importance insomuch as they constitute natural water retention basins .-- Copyright 1974, Biological Abstracts. Inc. W75-01100

2H. Lakes

AQUATIC WEED MANAGEMENT IN THE FINGER LAKES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 5G. W75-00554

CONTINUED EFFECTS OF TROPICAL STORM AGNES (1972) ON AQUATIC WEED GROWTH, Cornell Univ., Ithaca, N.Y For primary bibliographic entry see Field 5G.

A FEASIBILITY STUDY FOR A MOBILE SUB-MERSIBLE VEHICLE TO BE USED FOR THE CONTROL MANAGEMENT, STUDY OF NATU-RAL PROCESSES, PROTECTION AND CON-SERVATION OF INLAND WATER, Cornell Univ., Ithaca, N.Y.

For primary bibliographic entry see Field 7B. W75-00556

THE RELATIONSHIP OF WATER QUALITY TO LAND USE AROUND LAKES.
East Central Florida Regional Planning Council, Winter Park For primary bibliographic entry see Field 5G. W75-00560

Group 2H-Lakes

LAKE HYDRODYNAMICS,

Wisconsin Univ., Milwaukee. Center for Great Lakes Studies. C. H. Mortimer.

Mitteilungen Internationale Vereinigung Lim-nologie, Vol 20, p 124-197, 1974. 29 fig, 139 ref.

Descriptors: *Lakes, *Hydrodynamics, Optical properties, Model studies, Turbulence, Stratification, Thermocline, Seiches, Waves(Water), Depth, Physical properties, Circulation, Temperature.

Selected concepts of lake physics, particularly those which are fundamental to understanding th chemistry, biology, and management of lake systems are presented, concentrating on the dynamic aspects of water motions induced by thermo-gravitational forces, by wind, or by com-binations of both. Progress in physical limnology must be viewed as part of a more general evolution of concept and method in geophysical fluid dynamics. Discussion is directed to interaction etween turbulence and stratification. Shear instability and its aftermath play major roles in the dis-tribution of mechanical and heat energy,in thermocline formation (and microstructure), and in controlling seasonal patterns of circulation and temperature distribution. These patterns are determined by the interactions of two agents, both acting across the air/water interface: (i) the (positive downward) flux of wind-induced momentum, and (ii) a net flux of heat (positive or negative) arising from combined contributions of radiation balance, exchange of sensible heat, and thermal consequences of evaporation or condensation. It is possible to model the interactions between (i) and (ii) in quantitative and predictive terms. Limitations of these models become evident when the unsteadiness of the determinant processes or basin boundaries or the multidimensional nature of lake motions cannot be ignored. (Jones-Wisconsin) W75-00565

IMPLEMENTATION OF PELAGIC ECOSYSTEM MODEL FOR LAKES, Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering. For primary bibliographic entry see Field 5C. W75-00573

THE PHYSICAL LIMNOLOGY OF BIGHORN LAKE-YELLOWTAIL DAM, MONTANA: IN-TERNAL DENSITY CURRENTS,

Montana State Univ., Bozeman. Dept. of Botany

and Microbiology.
R. A. Soltero, J. C. Wright, and A. A. Horpestad.
Northwest Science, Vol 48, No 2, p 107-124, 1974. 13 fig, 2 tab, 10 ref.

Descriptors: *Density currents, *Reservoirs, *Physical properties, Montana, Currents(Water), Chemical properties, Thermal stratification, Conductivity, Inflow, Discharge(Water), Reservoir storage, Turbidity, Nitrates, Phosphates, Dissolved oxygen, Hydrogen ion concentration, Lim-nology, Withdrawal. Identifiers: *Bighorn Lake(Montana), *Yellowtail

Dam(Montana)

The physical limnology in Bighorn Lake and the establishment of internal density currents, the distribution patterns of various physical and chemical properties of the reservoir, resulting from the complex interaction of thermal stratification, density flow, and seasonal inflow and outflow investigated. A few of the parameters on which in-ternal density currents can have impact are the need to maintain a cool, potable, domestic water supply, and the need for maintaining water quality suitable for downstream irrigation, aquatic life and recreation. Transmissivity, temperature, and conductivity measurements were made from the surface of the reservoir to the bottom, at 5-m intervals and hydrogen ion concentration was deter-mined. The 1968 data revealed that an internal density current was established due to excessive sub-surface withdrawal through the power penstocks. The current appeared to extend approximately 50 km up-reservoir and was not detected in 1969 or 1970. A turbidity current was associated with the internal density current. Nitrate nitrogen and orthophosphate maxima as well as oxygen and pH minima were associated with the tubidity current. (Jones-Wisconsin) W75-00574

INTERACTIONS OF PHYTOPLANKTERS CUL-TURED FROM A POLLUTED SALINE LAKE, ONONDAGA LAKE, NEW YORK,

Cornell Univ., Ithaca, N.Y. Div. of Biological Sciences.

For primary bibliographic entry see Field 5C.

THE HYDROCHEMICAL LIVING CONDI-TIONS OF THE IMMATURE STAGES OF BOOPHTHORA ERYTHROCEPHALA DE GEER (DIPTERA, SIMULIIDAE): 2. DEVELOPMENT OF A TECHNIQUE FOR REARING UNDER EX-PERIMENTAL CONDITIONS, (IN GERMAN), Tuebingen Univ. (West Germany). Tropenmedizinisches Institut.

J. Grunewald.

Z Tropenmed Parasitol, Vol 24, No 2, p 232-249, 1973, Illus. English summary.

Descriptors: *Larvae, *Diptera. Identifiers: Boophthora-erythrocephala, Mon-stera, Simuliidae, *Blackflie.

The investigations of the hydrochemical living conditions of the immature stages of B. erythrocephala in the field reported in Part 1 (Grunewald 1972) provided the basis for rearing (Grunewald 19/2) provided the basis for basis, this blackfly species in the laboratory. In a series of experiments, after establishing the food requirements of blackfly larvae, the pH value and total water hardness of the culture water were adtotal water hardness of the culture water were adjusted to field conditions. Among the factors studied (02, C02, N compounds, phosphate, Fe, silicate, K, Mg, chloride, sulfate content, and KMn04 consumption) especially N-N02, N-N03, N-NH4, Cl- and S04- exceeded the values recorded in the field. By means of activated charcoal, the nitrite and nitrate content and, using the submerged roots of Monstera sp. (Araceae), the ammonium and phosphate content were even-tually adjusted. Other attempts to eliminate am-monium and phosphate by submerged plants failed because of water pollution due to decaying vegetable matter. By removing the sand from the con-tainer, sulfate and chloride levels were also lowered, at least temporarily. With most of the factors adjusted to field conditions, up to 44% of the egg larvae originally employed were successfully reared to the adult stage, and the number of individuals was estimated to increase more than 3-fold from 1 generation to another. The breeding apparatus now being used consists of a 5 1 jar, the water from which is regenerated by passing through an activated-charcoal filter into a 50 1 container with the submerged roots of Monstera sp.--Copyright 1974, Biological Abstracts, Inc. W75-00585

OBSERVATIONS ON INTERNAL. RECYCLING, REGENERATION AND OSCIL-LATION OF DISSOLVED NITROGEN AND PHOSPHORUS IN SHALLOW SELF-CON-TAINED LAKES,

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5C. W75-00588

EVAPORATION FROM LAKE MICHIE, NORTH CAROLINA 1961-71, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 2D. W75-00634

NATURAL EUTROPHICATION AND IMPROVEMENT OF LAKE QUALITY: A CASE HISTORY, ONEIDA LAKE, NEW YORK, Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 5C. W75-00642

A NON-TOXIC LAKE MANAGEMENT PRO-Clean-Flo Labs., Inc., Hopkins, Minn For primary bibliographic entry see Field 5C. W75-00672

SEASONAL PERIODICITY OF PLANKTON IN A FRESHWATER POND IN WEST BENGAL, INDIA,

Kalyani Univ. (India). Dept. of Zoology. B. B. Jana. Int Rev Gesamten Hydrobiol. Vol 58, No 1, p 127-143, 1973. Illus.

Descriptors: *Ponds, Zoo *Phytoplankton, Algae, Rotifers, Hydrogen ion concentration, *Seasonal. Zooplankton, rs. Diatoms. Identifiers: *India(West Bengal).

The paper describes a year-round limnoplanktonic study of a freshwater pond in West Bengal, India. Always predominant over zooplankton, phytoplankton demonstrates 3 peaks. The relationships between pH and phytoplankton, between phosphate and green algae and between rotifers and diatoms are significant. The role of physico-chemical factors in chemical factors in

STATISTICAL ANALYSES USED IN THE COM-PARISON OF THREE METHODS OF FRESH-WATER ZOOPLANKTON SAMPLING, Kongelige Norske Videnskabers Selskab, Trondheim. Museet. For primary bibliographic entry see Field 5C. W75-00688

ON THE FACTOR STRUCTURE OF WATER QUALITY, VEDEN LAADUN RAKENTEESTA, National Water Board of Finland, Helsinki. Research Inst. For primary bibliographic entry see Field 5C. W75-00691

DISTRIBUTION PATTERNS OF MUDFLAT VEGETATION IN IOWA FLOOD CONTROL RESERVOIRS. Iowa State Univ., Ames. Dept. of Botany and

Plant Pathology. For primary bibliographic entry see Field 2I. W75-00705

FAYETTEVILLE GREEN LAKE, NEW YORK. 6. THE ROLE OF TURBIDITY CURRENTS IN LAKE SEDIMENTATION, Massachusetts Univ., Amherst. Dept. of Zoology. For primary bibliographic entry see Field 2J. W75-00742

MICROBIOLOGICAL PROCESSES OF THE PRODUCTION OF HYDROGEN SULFIDE IN THE REPNOE LAKE (SLAVIC LAKES), (IN

THE REPROVE LAKE (SLAVIC LAKES), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field SC.
W75-00781

EXPERIENCES RELATIVE TO THE ICE REGIME IN HUNGARY (EXPERIENCES RELATIVES AU REGIME DES GLACES, ACQUISES EN HONGRIE),
Hydraulic Documentation and Information

Center, Budapest (Hungary).

For primary bibliographic entry see Field 2C. W75-00842

PECULIARITIES OF ICE COVER FORMATION ON RESERVOIRS, Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). For primary bibliographic entry see Field 2C. W75-00850

ROLE OF SNOWMELT IN FORECASTING GREAT LAKES LEVELS,
Department of the Environment, Ottawa Department of the Environment, O (Ontario). Water Planning and Management. For primary bibliographic entry see Field 2C. W75-00886

POPULATION STRUCTURE CHANGES AND VIELDS OF FISHES DURING THE INITIAL EIGHT YEARS OF IMPOUNDMENT OF A WARMWATER RESERVOIR, California State Dept. of Fish and Game, Sacra-

mento.

Kenneth A. Hashagen, Jr. Calif Fish Game. Vol 59, No 4, p 221-244, 1973. Identifiers: Age, Catfish, *Fishes, *Impoundment, Lepomis-cayanellus, Lepomis-macrochirus, Lepomis-microlophus, Micropterus-salmoides, Reservoirs, Salmonids, *Warm water reservoirs, Years, Fish populations.

Data from creel census and netting programs were used to study changes in the relative abundance, age, and species composition of fish during the first 8 yr of impoundment of Merle Collins Reservoir, Yuba County, California (USA). The effects of the changes of fish yields are discussed. High survival of the 1st (1964) year class of largemouth bass (Micropterus salmoides) produced a large population of slow growing bass that dominated the fishery through 1967. These fish limited survival and recruitment of all centrarchids in 1965 and 1966 and depressed initial vields. Largemouth bass and green sunfish (Lepomis cyanellus) declined numerically after 1968. Bluegill (L. macrochirus) and redear sunfish (L. microlophus) increased dramatically. Catfish remained stable and were probably underexploited. Salmonids, introduced in late 1966, increased total pressure and effort and raised annual yields. Age composition of centrarchids changed from adult fish and fish of the initial year class to a structure in which several year classes and all sizes were represented by the end of the 8-yr study. Anticipated changes in species composition failed to develop as numbers of nongame species remained extremely low throughout the study. High initial yields customarily associated with new impoundments were not obtained. Yields ranged from 2.3-10.7 lb/acre.—Copyright 1974. Biological Abstracts, Inc. W75-00887

LIMNOLOGICAL GUIDANCE FOR FINGER LAKES MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Natural
Resources; and New York State Coll. of Agricul-

ture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5G.

W75-00971

CHANGES IN WATER CHEMISTRY IN MARSHES OVER A 12-YEAR PERIOD FOL-LOWING ESTABLISHMENT,

Cornell Univ., Ithaca, N.Y. Dept. of Agronomy. D. R. Bouldin, D. J. Lathwell, E. A. Goyette, and

D. A. Lauer. N Y Fish Game J. Vol 20, No 2, p 129-146. 1973. Inds. Identifiers: Alkalinity, *Marshes, *New York, *Carbon dioxide, Photosynthesis, Season, Water chemistry, Annual. Changes in water chemistry (pH, O2 and alkalinity) were measured over a 12-yr period following establishment in 20 artificial marshes (in New York USA) varying in depth from 1 to 3 ft by 1/2-ft intervals. The partial pressure of CO2 in the water (calculated from alkalinity and pH) was usually less than atmospheric during the initial 7 yr, but during the last 5 yr, the water was usually super-saturated with respect to the atmosphere. Changes in alkalinity over time were consistent with those expected if the water tended toward equilibrium with calcium carbonate and dissolved CO2. The change in CO2 content of the water was related to changes in vegetation was submerged, and the source of C for this vegetation was inorganic C in the water. Rate of fixation by photosynthesis apparently exceeded the rate of supply across the air-water interface and decomposition of organic matter. During the last 5 yr, emergent macrophytes dominated some marshes. These plants derived their C from the air, but fell into the water during the winter. During the summer. decay of this vegetation exceeded the capacity of the submerged vegetation to fix inorganic C and, hence, CO2 accumulated in excess of that in the atmosphere .-- Copyright 1974, Biological Abstracts, Inc. W75-00973

TEMPERATURE OF THE LITTORAL WATERS OF LAKE TANGANIKA,

Institut Royal des Sciences Naturelles de Belgique, Brussels.

Bull Inst R Sci Nat Belg Biol. Vol 48, No 7, p 1-29,

Descriptors: *Littoral, Lakes, Africa, *Water temperature. Identifiers: *Lake Tanganika, Temperature.

Temperature of the littoral zone of Lake Tanganika (SE Africa) was recorded at the surface every 2 hr during the period from Jan. 27-July 7, 1960. A Negretti and Zambra 'mercury in steel' thermometer with circular recording and weekly graph was installed at Uvira (NW bank of the lake) at a depth of 0.60 m. Temperature increases were more abrupt (1 deg/2 hr at midday) than temperature decreases in the evening. This phenomenon is explained by the effects of the south wind, which rises between 10 AM and noon every day. At night, the wind off the land is primarily northerly. Seasonal variations are reflected in increases in mean daily temperature from 26.5 deg in early March to 28.5 deg in mid-May. Mean daily temperatures in the rainy season, when the prevailing winds are northerly, decreased from 27 deg in Jan. to 26.5 deg in March. The maximum absolute temperature observed was 29.4 deg on May 4 and 5 at beginning of the dry season, while the minimum absolute temperature for the 1st half of 1960 was 24.2 deg on Feb. 26. A graph of bi-hourly temperature readings at 10-day intervals reveals a progressive decrease in mean daily temperature during the rainy season, an abrupt increase in the middle of the rainy season, and an immediate decrease during the 1st months of the dry season (June-July).
Water temperatures near the banks are more likely to reveal warming and cooling trends in the morn-ing and evening. Lower temperatures on an open lake are attributed to wind action. Considerable cooling is observed at night and in the morning, probably as a result of an 'upwelling' caused by wind movement of surface waters.--Copyright 1973, Biological Abstracts, Inc. W75-01019

PRELIMINARY ENERGY BUDGET OF THE

NINESPINE STICKLEBACK (PUNGITIUS PUN-GITIUS) IN AN ARCTIC LAKE, Alaska Univ., College. Inst. of Arctic Biology. J. N. Cameron, J. Kostoris, and P. A. Penhale. J Fish Res Board Can. Vol 30, No 8, p 1179-1189.

Identifiers: *Alaska, *Arctic, Chironomids, Copepods, Daphnia, Density, *Energy budget, Feeding, Growth, *Ikroavik Lake(Alas), Ninespine, Plankton, Pungitius-pungitius, Plankton, Pu *Stickleback, Respiration. Temperature,

In a study of energy flow through the stickleback population of Ikroavik Lake, northern Alaska, O2 consumption was related to weight and temperature by the equation Log Y = -2.795 + .823.094 T where Y = micro l/min-1 O2 uptake; W = log weight, mg; and T = temperature. Growth was fairly rapid, with fish reaching about 21 mm at the end of the 1st year, 42 mm by the 2nd and 65 mm by the 3rd. No older fish were found. Food was primarily chironomid larvae and zooplankton, especially copepods and Daphnia. Estimates of daily ration were calculated from growth and metabolic data (23.4 cal/day for a 30-mm fish at 10C), gastric clearing rate determinations (12.2 cal/day at 15C), and laboratory feeding experical/day at 15C), and laboratory feeding experiments (24 cal/day at 10C). Population distribution was uneven. Higher densities were reached in early summer, up to 74 g/sq m in the marginal marsh areas. For specified days when temperatures were accurately known, an energy budget could be calculated for the population in given area, including estimates of population biomass, respiration, growth, ration and growth efficiency.-Copyright 1974, Biological Abstracts, Inc. W75-01061

GROWTH AND CHEMICAL COMPOSITION OF AQUATIC PLANTS IN TWENTY ARTIFICIAL WILDLIFE MARSHES,

CIAL WILDLIFE MARSHES,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
D. J. Lathwell, D. R. Bouldin, and E. A. Goyette.
NY Fish Game J. Vol 20, No 2, p 108-128. 1973.
Identifiers: "Aquatic plants, Artificial marshes,
Biomass, Calcium, Chara-spp, "Chemical composition, Depth, Growth, Iron, Magnesium, Manganese, "Marshes, "New York, Nitrogen, Phosphorus, Scirpus-spp.

Measurements of the standing crop of aquatic plants were made in 20 artificial marshes in New York in the summers of 1968, 1969, and 1970, some 10 yr subsequent to construction of the marshes. One sample was taken in June of 1968, and samples were taken in June and Aug. of 1969 and 1970. Botanical separation of the plant material was made on the samples taken in 1969 and 1970. Chemical analyses of the plant tissue were made on the Aug. 1969 sample and on both samples taken in 1970. The dominant plants found in the marshes belonged to the genera Scirpus and Chara. Scirpus dominated the shallow marshes and made up about 75% of the total plant material in the 1-ft marshes. Chara dominated the deeper marshes and made up nearly two-thirds of the vegetation in the 3-ft marshes. Above-ground standing crops ranged from about 800 g/m² in the shallow marshes down to about 300 g/m2 in the deepest marshes. The standing crop of the emergent vegetation was 3-5 times greater that of the submergent vegetation. The submergent vegetation, particularly Chara, was characterized by a very high ash content. The Ca content of Chara was 20% in contrast to 0.5% for Scirpus. For all species, the N content generally ranged between 1 and 2%, while the P content was above 0.1%, and little difference was noted between the submergents and the emergents. Scirpus was notable for its low Mg content, while the K content of Chara was substantially lower than that of any other species. The Mg and Fe content of the submergent species was in general higher than that of the emergent species.—Copyright 1974, Biological Abstracts, Inc. W75-01063

THE FERTILIZATION OF GREAT CENTRAL LAKE: III. EFFECT ON JUVENILE SOCKEYE

SALMON, Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.

Group 2H-Lakes

For primary bibliographic entry see Field 5C. W75-01064

THE DETERMINATION OF THE DAILY RATES OF PLANKTON PRIMARY PRODUC-TION: MODEL AND IN-SITU MEASUREMENTS (IN GERMAN), Eidgenoessische

Kastienbaum (Switzerland). Hydrobiology Lab. For primary bibliographic entry see Field 5C. W75-01077 Technische Hochschule.

VEGETATION ZONES AND WATER-LEVEL VARIATION OF LAKE MJORN, (IN SWEDISH), Goteborg Univ. (Sweden). Inst. of Systematic Botany.

L. Andersson. Sven Bot Tidskr, Vol 67, No 2, p 201-207, 1973, Illus. English summary.

Descriptors: *Water level fluctuations, Lakes, *Vegetation. Identifiers: *Sweden(Lake Mjorn).

The vertical limits of some littoral plant communities at Lake Mjorn in western Vastergotland, SW Sweden, were determined with the aid of the leveling instrument. Three distinct altitudinal zones have been found, within which the plant communi-ties form a 'unit box-system.' The limits of those zones are discussed and compared with an analysis of the water-level journals from the period 1951-1970.--Copyright 1974, Biological Abstracts, Inc. W75-01084

FOODHABITS OF YELLOW PERCH, SMALL-MOUTH BASS AND LARGE MOUTH BASS IN TWO UNPRODUCTIVE LAKES IN NORTHERN

MICHIGAN, Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.

M. D. Clady

Am Midl Nat, Vol 91, No 2, p 453-459, 1974. Identifiers: *Bass(Largemouth-smallmouth), Chaoborus, Chironomid, Entomostracan, *Fish foods, Growth rates, Insects, Lakes, *Michigan, Micropterus-dolomieui, Micropterus-salmoides, Perca-flavescens, *Yellow perch.

The food habits of 248 yellow perch (Perca Flavescens), 479 smallmouth bass (Micropterus dolomieui) and 551 largemouth bass (M. salmoides) from 2 unproductive lakes are presented by size of the fish and mo. of capture. In all 3 spp. the young-of-the-year ate small entomostracans; older fish ate insects and fish. Scarcity of fish in the diets of young largemouth bass and juvenile and adult smallmouth bass undoubtedly con-tributed to the slow growth of these species. The plantom midge (Chaoborus) and chironomid midges were important as food for smallmouth bass of all sizes. Adult smallmouth bass and yellow perch and juvenile largemouth bass were especially cannibalistic. Adult largemouth bass and yellow perch usually fed on small yellow perch in-stead of on small largemouth bass.--Copyright 1974, Biological Abstracts, Inc. W75-01091

2I. Water In Plants

PLANT STRATEGY, CO2-EXCHANGE AND PRIMARY PRODUCTION,

Centre National de la Recherche Scientifique, Montpellier (France). Centr Phytosociologiques et Ecologiques. Centre d'Etudes F F Eckardt

Oecol Plant. Vol 8, No 3, p 309-312, 1973.

Descriptors: *Primary production, *Carbon diox-

Identifiers: Arrhenatherum elatius, Arundo donax, Brachypodium ramosum, Drought, Festuca arundinacea, Helianthus annuus, Quercus ilex, Salicornia fruticosa, *France(Montpellier).

Measurements of primary production in: a Quercus ilex-dominated evergreen-hardwood forest, a shrubland dominated by Salicornia fruticosa and a grassland dominated by Arrhenatherum elatius were irrigated and Brachypodium ramosum were not irrigated. Studies similarly were conducted with 3 crops: Helianthus annuus, Arundo donax and Festuca arundinacea var. elatior. All work was conducted in the Montpellier, France region. Responses to light, temperature and drought are discussed.--Copyright 1974, Biological Abstracts, W75-00592

LONG-TERM STUDIES OF MEADOW VEGETATION IN THE LOWER CHU RIVER, (IN RUSSIAN), Akademiya Nauk Kazakhskoi SSR, Alma-Ata. In-

stitut Botaniki. O. M. Demina, E. I. Kharlamova, and L. Kh.

Yangalycheva Bot Zh. Vol 58, No 6, p 806-814, 1973, Illus, English summary.

Descriptors: *Grasslands, *Marshes. Identifiers: Chu River(USSR), *USSR(Kazakhstan).

The paper presents data on the yearly dynamics of the crop capacity, structure and phytomass of reed communities in different habitat - on peatlands with prolonged flooding and marshes with moderate flooding. Studies were carried out in 1966-70 in the Lower Chu-river (desert zone of Kazakhstan, USSR).--Copyright 1974, Biological Abstracts, Inc. W75-00599

AN INVESTIGATION OF THE RETURN FLOW FROM IRRIGATED LAND,
Texas A and M Univ., College Station. Water

Resources Inst. For primary bibliographic entry see Field 5B. W75-00698

DISTRIBUTION PATTERNS OF MUDFLAT VEGETATION IN IOWA FLOOD CONTROL RESERVOIRS.

Iowa State Univ., Ames. Dept. of Botany and Plant Pathology. I. H. Wilson.

Available from the National Technical Informa-Available 10th Relational Technical Institute 10th Service, Springfield, Va 22161 as PB-237 071, \$7.00 in paper copy, \$2.25 in microfiche. Ph D Dissertation, 1973, 176 p. 42 fig, 75 ref, 7 append. OWRT A-039-1A(2).

Descriptors: *Distribution patterns, *Mud flats, *Iowa, Vegetation, *Flood control, Floods, Water supply, Reservoirs, Plant populations, Weeds, Wetlands, Water levels, Soil environment, Soil analysis, Zoning, On-site investigations, Sampling. Identifiers: Cluster analysis, Perennial species, Experimental placting. Experimental planting.

Distribution patterns of mudflat vegetation were made of the flood pools of two flood control reservoirs in Iowa with areas of 56,500 and 24,800 acres. Annual, terrestrial, and semiaquatic weeds were dominant in the younger reservoir; perennial species were dominant in the older reservoir. Intensive vegetation studies were established by use of transects on the mudflats of the smaller reservoir. Zonation patterns were defined in terms of apparent dominance in meter-square increments of each transect. Cluster analysis of presence-absence data for each species occurring in each square meter plot indicated that some of the subjectively determined pattern was related to species distributions. Observations of germination and species establishment indicated that the season of substrate exposure and the relative elevation of the water level during the time of seed viability were major factors in the regulation of pattern occurrence. Experimental plantings on exposed mud indicated Echinochloa crusgalli var. frumantacea may be a valuable species for erosion control and noxious weed control. Sagittaria sp., Typha spp., Scirpus sp. and other wetland species within the area of frequent inundation suggested that colonization by marsh species may be possible in localized areas protected from extreme drying or from excessive turbulence during flood periods. (Roberts-ISWS)

GROWTH PRODUCTION, AND COMMUNITY COMPOSITION OF FISHES INHABITING A FIRST-, SECOND-, AND THIRD-ORDER STREAM OF EASTERN KENTUCKY, Delaware Univ., Newark. Dept. of Biological

Sciences. . A. Lotrich.

Ecol Monogr. Vol 43, No 3, p 377-397, 1973. Illus.

Descriptors: *Kentucky, Streams, *Fish populations, Fish reproduction, Fish food organisms, Analytical techniques, Invertebrates, Detritus, Growth rates

Identifiers: Vertebrates, Information theory.

Fish populations in a 1st-order, a 2nd-order and a 3rd-order stream were studied during the summers of 1967-68. The primary food of each fish species was determined. Available food sources included terrestrial invertebrates, aquatic primary production, aquatic invertebrates, aquatic vertebrates and detritus. Average daily growth rates showed that age-group I fish of most species grew faster in early than in late summer. The growth rate of most age-group II fish varied little between these seasons. Total numbers, total standing crop, and gross production were estimated for each species in each order. Total production was compared among stream orders on a per linear meter basis. Production values were nearly equal in 1st (2.35 g dry weight/linear m) and 2nd order (2.36), but increased in 3rd order (3.29). The relative importance of terrestrial invertebrates as an energy source decreased with increasing stream order. Aquatic primary production and aquatic inver-tebrates began to be utilized as energy sources in 2nd order. The aquatic vertebrates and detritus began to be utilized in 3rd order. The relative importance of aquatic primary production utilization increased in 3rd order, but the relative importance of aquatic invertebrate utilization was approxi-mately the same as in 2nd order. The community structure of the fish populations of each pool was analyzed with information theory and the ratio Community structure differed between 3rd-order and 2nd-order pools even when the same species complement was present. Stream order in most cases represents a biological unit which can be subdivided into microhabitats based on riffle, pool, type of substrate, etc. and addition in most cases proceeds by discrete units of stream order.--Copyright 1974, Biological Abstracts, Inc. W75-00780

FEEDING ORIENTED MOVEMENTS OF THE ATHERINID FISH PRANESUS PINGUIS AT MAJURO ATOLL, MARSHALL ISLANDS, National Marine Fisheries Service, Tiburon, Calif. Tiburon Fisheries Lab.

R. James, Chess.

U S Natl Mar Fish Serv. Fish Bull. Vol 71, No 3, p 777-786. 1973, Illus.

Identifiers: Amphipods, *Atherinids, Atolls, Caridean, Copepods, Diurnal, *Fish feeding, Foraminifera, Islands, Lagoons, Larvae, Majuro, Ostracods, Plankton, *Pranesus-Pinguis, Shrimp, *Fish movements, *Marshall Islands.

Water In Plants—Group 21

The feeding behavior of the atherinid Pranesus Pinguis was studied in the lagoon at Majuro Atoll, Marshall Islands, during March 1972. During the day, individuals larger than about 35 mm (standard lenght) assemble in relatively inactive schools along the shore. Shortly after sunset the schools migrate offshore to feeding grounds in the lagoon, following the same route night after night. Once out in the lagoon the schools disperse and individuals 2-5 m apart feed on plankton at the water's surface throughout the night. Their prey include hyperiid amphipods, caridean shrimp lar-vae, myodocopid ostracods, the tretomphalus vae, myodocopid ostracods, the tretomphalus stage of foraminiferans and calanoid copepods. Most of their prey are at the surface at night, but at greater depths in daylight. At first morning light the silverside begin to concentrate in the shoreward part of their feeding ground. Then about 45 min before sunrise, having reached daytime pro-portions, the school moves inshore over the same route it had taken outward the night before and at about 20 min before sunrise arrives at its diurnal schooling site to takek up its relatively inactive daytime mode. In contrast, limited evidence indicates that individuals smaller than about 30-mm standard length feed by day but not at night.— Copyright 1974, Biological Abstracts, Inc. W75-00959

THE VEGETATION OF THE GILDEHAUSER VENNS (GRAFSCHAFT BENTHEIM DISTRICT), (IN GERMAN),

K. Dierssen. Beih Ber Naturhist Ges Hannover. 8. p 1-120. 1973. Illus.

Permeability, Pollution, Soils, *West Germany(Gildehauser Identifiers: *West *Vegetation, Venns), Hydrogen ion concentration.

The sociological progression and distribution of the 34 associations belonging to the classes Lemnetea, Corynephoretea, Isoeto-Nano juncetea, Bidentetea, Stellarietea mediae, Epilobietea angustifoli, Potamogetonetea, Littorelletea, Phragmitetea, Sedo-Scleranthetea, Molinio-Arrhenateretea, Scheuchzerietea, Caricetea fuscae, Oxycocco-Sphagnetea, Nardo-Callunetea, Alnetea glutinosea, Betulo-Pinetea and Quercetea roboripetraeae, 6 associations without a specific synsystematic classification and the 6 moss synusia which are also abundant in the region, are presented. The pH, exchange capacity, permea-bility, chemical water analyses and water flow analyses showed that base content of the soil increases toward the north and water pollution increases from the east to the west. Special attention is paid to living conditions for Eleocharitetum multicaulis and Lobelietum dortmannae and their endangerment through water pollution. A widening of the nature protection area was recommended.—Copyright 1974, Biological Abstracts, Inc. W75-00974

DERWENT ESTUARY FISH NETTING SURVEY

1972/73, Tasmanian Dept. of Agriculture, Hobart (Australia). Sea Fisheries Div. For primary bibliographic entry see Field 2L. W75-01008

INTERNAL CONTROL OF STOMATAL PHYSIOLOGY AND PHOTOSYNTHESIS I. STOMATAL REGULATION AND ASSOCIATED CHANGES IN ENDOGENOUS LEVELS OF ABSCISIC AND PHASEIC ACIDS,
Commonwealth Scientific and Industrial Research

Organization, Glen Osmond (Australia). Div. of

Organization, cien Osmona (Austraus). Div. of Horticultural Research. B. R. Loveys, and P. E. Kriedemann. Australian Journal of Plant Physiology, Vol 1, No 3, p 407-415, September 1974. 1 fig. 4 tab, 26 ref.

Descriptors: *Stomata, *Transpiration, *Plant growth substances, Plant physiology, Diffusion, Moisture stress, Photoperiodism, Leaves.

Identifiers: *Abscisic acid, *Phaseic acid, *Vitis

Both environmental factors and manipulative treatments (such as fruit excision or stem cincturing) were found to alter gaseous diffusion re-sistances in grape vine foliage. These responses have been analysed in terms of the hormonal physiology of Vitis vinifera leaf tissue. Environmental factors such as moisture stress of photoperiod alterations which contributed towards an increase in stomatal resistance were correlated with increased levels of endogenous abscisic acid and phaseic acid in mature foliage. Conversely, treatments which elicited a decrease in stomatal resistance were associated with lower levels of both abscisic and phaseic acids. The effect could be found even where the corresponding effect on leaf water potential was not observed. It is proposed that changes in enogenous levels of abscisic acid, and possibly phaseic acid, constitute a mechanism for regulating gas exchange in these perennial plants. (CSIRO) W75-01012

EFFECT OF PREVIOUS WATER STRESS ON ION UPTAKE AND TRANSPORT IN BARLEY SEEDLINGS.

Technische Hochschule, Darmstadt (West Ger-

many). Botanisches Institut.
M. G. Pitman, U. Luttge, A. Lauchli, and E. Ball.
Australian Journal of Plant Physiology, Vol 1, No
3, p 377-85, September 1974. 4 fig, 2 tab, 30 ref.

Descriptors: *Moisture stress, *Ion transport, *Translocation, Plant physiology, Proteins, Bar-ley, Wilting, Plant growth substances, Photosynthesis, Respiration, Inhibitors. Identifiers: *Abscisic acid.

Measurements of ion transport through roots and ion uptake into roots were made following a brief period of water stress induced by wilting in air. The basic processes of photosynthesis, respiration and protein synthesis did not appear to be affected by this treatment, and uptake of 86-Rb and L-leucine to the roots was not reduced. However, transport of 86-Rb and L-leucine from root to shoot was inhibited. Thus the response of the plants to water protein synthesis and to abscisic acid, which has been found to be produced in plants subject to water stress. (CSIRO) W75-01013 stress resembles the response to inhibitors of

WATER SHORTAGE AND AGRICULTURE:

SOME RESPONSES, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 3F.
W75-01014

THE MICROCLIMATE OF ARCTIC PLANTS AND ANIMALS, ON LAND AND IN FRESH WATER, Waterloo Univ. (Ontario). Dept. of Biology.

Acta Arct. 18, p 1-43. 1972. Illus.

Descriptors: Freshwater, *Climates, *Cold regions, *Plant growth, *Arctic, Animals, Tempera-

Identifiers: Diel. Insolation, Microclimates, Arctic

The biologically significant features of arctic microclimates relate to the seasonal and diel patterns of insolation. In summer, it is generally cool throughout the environment except in a shallow air layer above the soil surface (the plant climate) and, to a lesser extent, at the margins of fresh water. The reduction in diel fluctuation of the sun's altitude means that north of a certain latitude, about 75N, summer conditions in the plant climate improve in certain respects: temperatures depart less from the diel mean; most of the growth season is frost-free and temperature inver-sions over level, unshaded terrain are rare or absent. An additional, separate consequence of high latitude is that the atmosphere is drier, due to the proximity of permanent ice and so, at least in noncoastal sites, there are likely to be more sunny days. In sunshine, plants and animals inhabiting this zone raise their own temperature yet further by their structure, posture or orientation. These 2 circumstances may give plants and (especially) animals access to temperatures at least 20C above current screen values. The main factor cooling in-solated objects is wind. Some of the attributes an arctic locality should possess if it is to provide microclimates optimal for a given latitude in summer are, many hours of sunshine, exposure to katabatic winds, an acceptable balance between the presence of hills (preferably in the north) ability to absorb counter-radiation and the absence of hills that might obscure the sun, moderate wind from a direction that does not neutralize the effects of direct insolation, a south-facing aspect, ground of low thermal conductivity and the presence of ponds and moderate-sized lakes without marginal shade and with gently sloping shores. For winter survival the desirable features are an early, heavy snowfall that is well distributed over level and south-facing ground and that melts quickly in spring, and the presence of moderate-sized lakes more than 2 m deep.--Copyright 1974, Biological Abstracts, Inc.

AQUARIUM STUDIES ON THE CONSUMP-TION OF SMALL ANIMALS BY O-GROUP GRASS CARP, CTENOPHARYNGODON IDEL-LA (VAL.),

Marine Dept., Rotorua (New Zealand). Fisheries Research Div.

D. J. Edwards

J Fish Biol. Vol 5, No 5, p 599-605. 1973. Identifiers: *Carp(Grass), Con Consumption, *Invertebrates, Consumption, Consumption, Consumption, Ctenopharyngodon-idella, *Invertebrates, Spawning, *Fish eggs, Aquatic animals, Trout fry, Rainbow trout eggs, *Fish foods.

In aquarium experiments common invertebrates from streams and ponds were offered to O-group grass carp. Ctenopharyngodon idella in the presence of palatable plants. When there was no cover for the prey to hide under, the carp ate many of the invertebrates, but when stones were provided, considerably more invertebrates escaped. Rainbow trout eggs were not eaten, but trout fry were taken as soon as they had emerged from ar-tificial spawning redds. While searching for food, grass carp never disturbed the stones covering possible food organisms.—Copyright 1974, Biological Abstracts, Inc. W75-01058

GROWTH AND CHEMICAL COMPOSITION OF AQUATIC PLANTS IN TWENTY ARTIFICIAL WILDLIFE MARSHES,

Cornell Univ., Ithaca, N.Y. Dept. of Agronomy. For primary bibliographic entry see Field 2H. W75-01063

SOIL MOISTURE CONTENT AND ROOT EXU-DATES IN RELATION TO RHIZOSPHERE EF-FECT IN LEGUMINOUS WEEDS, Bangalore Univ. (India). Dept. of Botany.

S. B. Sullia.

Proc Indian Acad Sci Sect B. Vol 77, No 6, p 264-275. 1973. Illus.

Identifiers: Amino acids, Cassia-tora, Crotalaria-medicaginea, *Fungi, *Leguminous weeds, Rhizo-sphere, *Root exudation, Soils, Sugars, *Weeds, sphere, Soil moisture

In the leguminous weeds, Cassia tora L. and Crotalaria medicaginea Lamk., the ageing of the plants was accompanied by a quantitative increase

Group 21-Water In Plants

in the rhizosphere fungal population which reached the maximum level at the senescent stage of the plants when the moisture content of the soil had fallen significantly. Concomitant with these phenomena was the decrease in the amino acids and sugars contained in the root exudates. The role of root exudates, moribund root cells and the moisture content of the soil in bringing about these changes in the mycoflora are discussed.--Copy-right 1974, Biological Abstracts, Inc. 75-01065

CLEAN CULTIVATION AND THE ESTABLISH-MENT OF PINUS KESIYA IN ZAMBIA, F. Endean, and B. E. Jones.

E Afr Agric For J. Vol 38, No 2, p 120-129. 1972.

Descriptors: *Pine trees, Weeds, Weed control, Africa, *Cultivation, Growth rates. Identifiers: Brachystegia, Pinus kesiya, *Zambia.

In Zambia, pine sawtimber plantations are established on Brachystegia-Isoberlinia sites where there is a mean annual rainfall of 48-50 in. and a dry season of 263 days. When the indigenous wood land is cleared, a dense ground vegetation (86% grass) develops which competes with the planted stock and weeding is necessary until canopy closure takes place. A satisfactory weeding regime for P. kesiya in its 1st yr after planting, the relative importance of degree of site preparation, and the possible relation between growth on one hand and the quantity of weeds remaining and soil moisture on the other hand, were determined. Site preparation had no effect on any of the variable measured and did not interact with weeding treatment. Differences in weeding intensity produced significant differences in weight of weeds remaining at the end of the wet season and corresponding significant reductions in soil moisture. Tree growth was better and quantity of weeds less on the fine textured soil type. Reduced weeding allows a greater quantity of grass to per-sist during the wet season which depletes soil moisture. Despite removal of weeds at the end of the wet season, this depletion of soil moisture is significantly correlated with reduced survival and growth at the end of the following dry season. Reduced weeding may be a 'false economy'; it reduces growth and prolongs the period until canopy closure and weed suppression takes place.--Copyright 1974, Biological Abstracts, Inc. W75-01070

INITIAL RESULTS OF TWO DRAINAGE EX-

PERIMENTS WITH PLANTATION OF CONIFERS, (IN FRENCH), Cent. Natl. Rech. For., Einville, Fr. Inst. Natl. Rech. Agron. Centre National de Recherches Forestieres, Einville-au-Jard (France). Station de Recherches Sur les Sols Forestiers et la Fertilisa-

Ann Sci For, Vol 29, No 4, p 427-450, 1972, Illus. English summary

Descriptors: *Ditches, *Drainage, *Conifers. Identifiers: *France.

Four drainage modalities were compared: draining ditches distant of about 40 m. 20 m and 10 m. and outletes distant of about 40 m, 20 m and 10 m, level is much smaller between the modalities 20 and 10 m than between the modalities 40 and 20 m. The average level of the water-table for the ridges was intermediate between those of modalities with ditches 40 and 20 m apart. The influence of soil works on lowering of mortality rate and on the growth in height of the plants was observed. The differences of level of the water-table at Evaux-etMenil (France) between the 3 modalities with ditches were small. The relative level of the watertable on tops of the ridges was lower than in the modalities with ditches.--Copyright 1974, Biological Abstracts, Inc. W75-01071

CO-OCCURRENCE OF POLISH FISH SPECIES IN RIVERS DEPENDING UPON ENVIRON-MENT, (IN POLISH), Polskie Towarzystwo Przyrodnikow im. Koper-

nika, Warsaw.

T. Penczak Kosmos Ser A biol (Warsaw), Vol 22, No 3, p 255-

Descriptors: Brook trout, *Fish, *Oxygen requirements, *Water temperature. Identifiers: Barbel, Bream, Grayling, *Poland.

General remarks on ichthyofauna regions are given, followed by descriptions of the main re-gions distinguished in Poland. These are following: brook trout, grayling, barbel, bream. Division into ichthyofauna regions should be based on species having a narrow life scale and limited adaptability capabilities. Only such species can be looked upon as characteristic for a given region. Water temperature and O2 content are the 2 main environmental factors decisive for the occurrence of a given fish species. Concerning O2 requirements, 4 groups of fish species are distinguished but only 2 are discussed .-- Copyright 1974, Biological Abstracts, Inc. W75-01076

DEPTH OF PENETRATION OF THE ROOTS OF SOME EDIFICATORS IN NATURAL PHYTOCENOSES OF THE DESERT IN THE

ALMA-ATA OBLAST, (IN RUSSIAN), Kazakhskii Gosudarstvennyi Selskokhozyaistvennyi Institut, Alma-Ata (USSR). O Raitulin

Probl Osvoeniya Pustyn', 5, p 54-55, 1972.

Descriptors: *Root systems, Deserts, *Soil physical properties. Identifiers: Anabasis, Artemisia, *Edificators, Eu-

rotia, Haloxylon, Lasiagrostic Tamarix, *USSR(Alma-Ata Oblast).

The nature of root system development was studied in various desert coenoses (USSR) in relation to specific soil conditions. On common loamy sierozem the roots of winterfat penetrated 3-5 m. The tap root was covered with secondary roots to a depth of 60 cm. The root system of Eurotia ceratoides and Lasiagrostis splendens penetrated to 9 and 6 m respectively, reaching ground water vicinity. In light sierozem formed on loess-like sandy loam, plant development was more intense. Winterfat plants were larger but the roots did not penetrate to the zone of capillary-drawn ground water due to accumulation of moisture from rainfall in the soil and sufficient supplies in the roots. In some areas sierozems with hydromorphic properties also supported meadow plants. On these soils the root system of Salicornia europaea reached a depth of 75 cm, that of Tamarix ramosissima to 210 cm; the latter developed strong lateral roots. On stony light sierozem roots wandered and penetrated to shallow depths. Artemisia terrae-albae roots reached 65-80 cm, those of Anabasis truncata 180 cm and of Eurotia ceratoides 360 cm. On typical solonchak, roots of Salicornia europaea penetrated to 60-70 cm, on solonchak-sierozem to 80 cm. Plants growing on sands developed strong root systems, for example Haloxylon aphyllum penetrated to 10 m, reaching ground water. About 25 plant species are discussed. Analysis of root 2.3 prant species are discussed. Analysis of root development under desert conditions is a good means of studying the effect of edaphic factors on plants.—Copyright 1974, Biological Abstracts, Inc. W75-01078

SUCCESSION OF INUNDATED FORESTS ON THE ISLANDS OF THE RIVER BELAYA, (IN RUSSIAN), T. V. Popova

Byull Mosk O-Va Isp Yt Prir Otd Biol, Vol 78, No 3, p 119-126, 1973, Illus. English summary.

Descriptors: *Forests, *Succession, Rivers, Islands, Herbs, Shrubs.

nigra, Tilia cordata. Identifiers: Populas *USSR(River Belaya).

The changes, occurring with the ageing of River Belaya, USSR flood-plain islands in the tree, shrub and herb layers of inundated forests, are considered. In the tree layer a secondary reestablishment of Populus nigra takes place, but not of Tilia cordata. In the shrub layer, species typical of river-side environment are present in areas more than 60 yr old. No clear-cut age groupings are observed in the herb layer.--Copyright 1974, Biological Abstracts, Inc. W75-01079

AGE COMPOSITION OF POPULATIONS OF TUFTED HAIRGRASS (DESCHAMPSIA CAESPITOSA (L.) P.B.) ON FLOODPLAIN PASTURES OF THE NORTH DVINA AND OKA RIVERS, (IN RUSSIAN), Moskovskii Gosudarstvennyi Pedagogicheskii In-

For primary bibliographic entry see Field 4A. W75-01080

MORPHOLOGICAL ANATOMIC AND CHARACTERISTICS OF CUCUMBER AND TO-MATO ROOTS UNDER HYDROPONIC CONDI-TIONS, (IN RUSSIAN), M. V. Zelenina

Biol Nauki, Vol 16, No 7, p 73-77, 1973, Illus.

Descriptors: *Root systems, *Hydroponics, *Cucumbers, *Tomatoes.

With the hydroponic method of growing cucumbers and tomatoes, the length of the root decreases, their branching increases, and the cortical part and stele of the root develop more appreciably. Owing to the sharp temperature fluctua-tions in artificial substrates, there are more cases of cracking of the root collar than in a soil culture. Despite this, cucumbers on artificial media were not inferior to the control in yield owing to the increased ability of the plants grown hydroponically to set fruit.--Copyright 1974, Biological Abstracts, W75-01094

EXTENSION OF THE CULTURE OF NORWAY SPRUCE BEYOND ITS ZONE OF NATURAL OCCURRENCE, (IN FRENCH),

Institutul de Studii st Proiectari Forestiere, Bucharest (Rumania). G. Marcu.

Bull Acad Sci Agric For, 2, p 121-131, 1973, Illus.

Descriptors: Soil physical properties. Identifiers: *Norway spruce, Soil humidity.

Factors affecting productivity of Norway spruce stands are precipitation, soil humidity, edaphic texture, structure and volume, physiological characteristics, and, to a minor extent, trophicity of soil. The increase in ligneous mass averages 4 cu m/yr/ha. The physical and mechanical proper-ties of the wood vary depending on the climate. The yield is ton/ha/yr is much greater than that of oak. Norway spruce grows best in a mixed culture of deciduous and coniferous trees; its extension is most advantageous to localities with poor condi-tions for natural stands.—Copyright 1974, Biological Abstracts, Inc.

2.J. Erosion and Sedimentation

SEDIMENT CHARACTERISTICS OF FIVE STREAMS NEAR HARRISBURG, PA., BEFORE HIGHWAY CONSTRUCTION,

Geological Survey, Harrisburg, Pa. L. A. Reed.

Open-file report 74-140, July 1974. 33 p, 24 fig, 1 tab. 6 ref.

Descriptors: *Sediment yield, *Road construction, *Pennsylvania, Highways, Excavation, Sedimentation, Erosion, Erosion control, Turbidity. Identifiers: *Harrisburg(Pa).

Rainfall, streamflow, sediment, and turbidity data were collected as part of a study to evaluate the ef-fects of highway construction on sediment discharge. The study is also designed to determine the effectiveness of different erosion-control measures in reducing sediment discharges. The study area, near Enola, Pa., consists of five adjacent drainage basins, four of which will be crossed by Interstate 81. Ninety percent of the land in each of the basins is in forest or grass. Active farmland ac-counts for less than 10%, and the remainder is in roadways and buildings. The major factor affecting sediment concentrations and discharges was the construction of a one-lane roadway and a 5-acre farm pond in basin 2. Approximately 100 tons of sediment was discharges by the stream as a result of the roadway and pond construction. (Knapp-USGS) W75-00628

FAYETTEVILLE GREEN LAKE, NEW YORK.
6. THE ROLE OF TURBIDITY CURRENTS IN LAKE SEDIMENTATION,

Massachusetts Univ., Amherst. Dept. of Zoology. S. D. Ludlam.

Limnology and Oceanography, Vol 19, No 4, p 656-664, July 1974. 4 fig, 1 tab, 24 ref.

Descriptors: Sedimentation, *Sediment transport, *Turbidity currents, *Sediment distribution, *Varves, Sedimentology, *New York, Lakes, Onsite data collections, Petrology, Distribution, Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sedimentology, *Sediment transport, ments, *Lake sediments. Identifiers: *Fayetteville Green Lake(NY), Tur-

Turbidity currents are formed in Fayetteville Green Lake by sediment slumping on the sides of the lake basin. Deposition from these currents accounts for about 50% of all sediment accumulation on the floor of the main basin. Rate of sediment loss from the basin sides through the formation of loss from the basin sides through the formation of turbidity currents approximately equals nonturbiditie sedimentation rates on the gently sloping basin floor. Major turbidity currents arise most frequently where sources of terrestrial sediment are present. Major turbidity currents involve about 200-300 cu m (dry volume) sediment and extend over about 60000 sq m. (Gibb-ISWS)

BOTTOM DRIFT DUE TO PERIODIC SHALLOW WATER WAVES, Hawaii Univ., Honolulu. Dept. of Mathematics. For primary bibliographic entry see Field 2L. W75-00751

WINTER MEASUREMENTS OF SUSPENDED SEDIMENTS, Survey of Canada, Ottawa (Ontario). N. Tywoniuk, and J. L. Fowler.

Descriptors: *Discharge measurement, *Ice cover, *Sampling, *Suspended load, Stream gages, Arctic, Canada, Streamflow, Ice, Slush, Equipment, Velocity, Flow measurement.

Measurement of streamflow and suspended sedi-ment discharge under winter conditions in Canadi-

an Prairie watercourses is difficult of substantial ice thicknesses, slush ice, freezeup of equipment, and hazardous conditions. The techniques of measurement and computation of flow and sediment discharge under ice are quite different from those of open water. Two naturally occurring circum-stances alleviate the winter measurement problems: these are the comparatively low discharges (flow and suspended sediment) and the low variations in these parameters during ice conditions. An alternative measurement technique depends on a relationship between discharge computed from a point velocity observation at a single vertical in a cross-section and that computed by the standard procedure. The time and effort that be saved by this single-point method is evident. A technique for sediment measurement is analagous to the one-vertical method suggested for flow measurement. Individual samples are taken at only one vertical in the cross-section at a location which is approximately representative of the average channel conditions. Automatic pumping samplers can be used to obtain samples from a point near one of the banks of the cross-section. Similarly, photoelectric techniques can be applied for continuous concentration sensing and recording, thus producing improved data and simplifying the physical difficulties of data collection. (See also W75-00809) (Knapp-USGS) W75-00871

CRAWFORD CREEK SUBWATERSHED PRO-JECT, LITTLE SIOUX RIVER WATERSHED, IDA COUNTY, IOWA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Soil Conservation Service, Des Moines, Iowa. For primary bibliographic entry see Field 4D. W75-00935

COASTAL STABILISATION AT BARTON-ON-SEA, For primary bibliographic entry see Field 6B.

SOIL EROSION AND SILTATION WITHIN THE MURRAY VALLEY (AUSTRALIA). Soil Conservation Service of New South Wales, Sydney (Australia). For primary bibliographic entry see Field 4D. W75-01010

TUNNEL EROSION--A FIELD STUDY IN THE RIVERINA, Soil Conservation Service, New South Wales (Australia). For primary bibliographic entry see Field 4D. W75-01011

2K. Chemical Processes

W75-01006

THE ECOLOGY OF THE NAVASOTA RIVER. TEXAS, Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 2E. W75-00558

1973: PART 2-WATER QUALITY RECORDS. Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 7C. W75-00625 WATER RESOURCES DATA FOR COLORADO.

WATER-POLLUTION ASSESSMENT AND ASTM COMMITTEE D-19, Geological Survey, Lakewood, Colo. Water Resources Div. For primary bibliographic entry see Field 5A. W75-00636

THE RELATIONSHIP BETWEEN LITHOLOGY AND TRACE-ELEMENT CONTENT GROUND WATER, Geological Survey, Rolla, Mo. Water Resources For primary bibliographic entry see Field 2F. W75-00643

STORAGE EFFECTS AND MERCURY ANALY-SIS OF NATURAL WATERS, Naval Research Lab., Washington, D.C. For primary bibliographic entry see Field 5A. W75-00656

ANALYSIS OF MERCURY, LEAD AND OTHER METALS IN ENVIRONMENTAL SAMPLES, Naval Undersea Center, San Diego, Calif. Chemical Oceanography Branch.
For primary bibliographic entry see Field 5A.
W75-00657

PROBLEMS OF STORING AND ANALYZING MERCURY SAMPLES COLLECTED IN A NEARSHORE ENVIRONMENT, Naval Oceanographic Office, Washington, D.C. For primary bibliographic entry see Field 5A. W75-00658

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGEMENT, VOLUME I: DEVELOPMENT OF THE GROUND WATER QUALITY MODEL, California State Dept. of Water Resources, Sacramento. For primary bibliographic entry see Field 2F. W75-00702

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGMENT, VOLUME II: DEVELOPMENT OF HISTORIC DATA FOR THE VERIFICATION OF THE GROUND WATER QUALITY MODEL OF THE SANTA CLARA-CALLEGUAS AREA, UNDITED A COUNTY VENTURA COUNTY, California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 2F. W75-00703

QUATERNARY SYSTEM UREA, AMMONIUM NITRATE AND MONOAMMONIUM PHOSPHATE AT 25 C. For primary bibliographic entry see Field 5B. W75-00760

SUPERSATURATION IN THE AQUEOUS SYSTEMS NH4H2PO4 - NH4NO3 - KCL AND NH4H2PO4 - NH4NO3 - CO(NH2)2, Leningrad Lensoviet Technological Inst. (USSR). For primary bibliographic entry see Field 5B. W75-00794

THE MAP ABSTRACT RESOURCES: ALABAMA, OF WATER Geological Survey, University, Ala.
For primary bibliographic entry see Field 7C. W75-00797

PHYSICS AND CHEMISTRY OF SNOWFALL AND SNOW DISTRIBUTION,
Atmospheric Environment Service, Toronto (Ontario). For primary bibliographic entry see Field 2C. W75-00810

O-18/O-16 ABUNDANCE VARIATIONS IN SIER-RA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH, Calgary Univ. (Alberta). Dept. of Physics.

Field 2-WATER CYCLE

Group 2K—Chemical Processes

For primary bibliographic entry see Field 2C. W75-00812

DEUTERIUM AS A TRACER IN SNOW HYDROLOGY, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 2C.

SPECIFIC ELECTROLYTIC CONDUCTIVITY OF SNOW AND DEEP CORE SAMPLES, CANADIAN ARCTIC ARCHIPELAGO, Department of Energy, Mines and Resources, Ottawa, (Ontario). Polar Continental Shelf Project. For primary bibliographic entry see Field 2C. W75-00814

ENERGY EXCHANGE AT AIR-ICE INTER-FACE, Munich Univ. (West Germany). Meteorologisches Institut.

For primary bibliographic entry see Field 2C. W75-00820

SALINITY CHANGES IN THE COLVILLE RIVER DELTA, ALASKA, DURING BREAKUP, Louisiana State Univ., Baton Rouge. H I Walker

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 514-527, 1973. 8 fig. 3 tab, 7 ref. ONR-GP Contract N00014-69-A-0211-0003

Descriptors: *Water quality, *Salinity, *Ice breakup, *Sea ice, Deltas, Saline water intrusion, Floods, Alaska, Permafrost, Arctic. Identifiers: *Colville River(Alaska).

In the initial stages of flooding with ice breakup saline water which had accumulated in distributaries during winter was removed. Once flooding reached the ocean, water moved seaward on top of the ice as well as in channels beneath it. Surface flow extended outwards 12 km where it drained through numerous openings. Salinity measurements made through holes drilled in the 2-m-thick ice show that water advanced northward between 35 and 40 km beneath the sea ice at a rate of about 4.5 m/s. This floodwater formed a sharply delineated wedge between the seawater beneath and the sea ice above. (See also W75-00809) (Knapp-USGS) W75-00845

ONTARIO INTENSIFIES SEARCH FOR ASBESTOS IN DRINKING WATER, Ontario Ministry of the Environment, Toronto. Sanitary Engineering Branch.
For primary bibliographic entry see Field 5A. W75-01000

DOWN-HOLE EH-PH PROBE AND WATER SAMPLER,
Commonwealth Scientific and Industrial Research

Organization, Floreat Park (Australia). Div. of Mineralogy. For primary bibliographic entry see Field 7B.

COMPARISON OF CURRENT CHEMICAL METHODS FOR EVALUATING IRRIGATION SOILS, Commonwealth Scientific and Industrial Research

Commonwealth Scientific and Industrial Research Organization, Canberra, (Australia). For primary bibliographic entry see Field 2G. W75-01027 ON THE PHENOMENON OF DESORPTION AT THE AIR/WATER INTERFACE, Florence Univ. (Italy). Dept. of Physical Chemis-

For primary bibliographic entry see Field 5A.
W75-01069

2L. Estuaries

A FEASIBILITY STUDY FOR A MOBILE SUB-MERSIBLE VEHICLE TO BE USED FOR THE CONTROL MANAGEMENT, STUDY OF NATU-RAL PROCESSES, PROTECTION AND CON-SERVATION OF INLAND WATER, Cornell Univ., Ithaca, N.Y.

For primary bibliographic entry see Field 7B. W75-00556

STOCHASTIC MODEL FOR A DYNAMIC ECOSYSTEM, Virginia Polytechnic Inst. and State Univ., Blacksburg Dept. of Statistics. For primary bibliographic entry see Field 5B. W75-0055

HYDROGEOLOGIC ASPECTS OF STRUCTURAL DEFORMATION IN THE NORTHERN GULF OF MEXICO BASIN,

Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center. For primary bibliographic entry see Field 2F. W75-00618

NEARSHORE CIRCULATIONS UNDER SEA BREEZE CONDITIONS AND WAVE-CURRENT INTERACTIONS IN THE SURF ZONE,

Tetra Tech, Inc., Pasadena, Calif. E. K. Noda, C. J. Sonu, V. C. Rupert, and J. I.

Available from NTIS, Springfield, Va., 22161, as AD-776 643, \$7.25 in paper copy, \$2.25 in microfiche. Technical Report No 4, February 1974. 205 p, 26 fig, 29 tab, 52 ref, 2 append. ONR-GP Contract, N00014-69-C-0107.

Descriptors: *Waves(Water), *Littoral drift, *Currents(Water), *Surf, Mathematical models, Water circulation, Numerical analysis, Rip currents, Vortices, Mass transfer.

Identifiers: *Nearshore circulation, *Wave-cur-

rent interactions.

Numerical models for nearshore circulation patterns in the surf zone were developed and applied to an observed condition in a sea breeze environment. Bottom topography and input waves were derived from observed data to predict surf zone circulation as a function of time. Wave-current interactions were modeled for shallow water assuming a two-dimensional motion which included rip current and longshore current components. The refraction effects caused by even small currents produce major changes in the wave-induced driving forces in the surf zone. This leads to the prediction of entirely different rip-current patterns when wave-current interactions are considered. A review of water wave theories includes mass transport, vorticity and current for a vertical section in shallow water of constant depth. (Knapp-USGS)

FIELD MEASUREMENTS REQUIRED FOR VERIFICATION OF POLLUTION DISPERSION COMPUTATIONS WITH HYDRODYNAMICAL-NUMERICAL MODELS, Environmental Prediction Research Facility

Environmental Prediction Research Facili (Navy), Monterey, Calif. For primary bibliographic entry see Field 5B. W75-00660 LENGTH AND WEIGHT RELATIONSHIPS AND THE POTENTIAL PRODUCTION OF THE BIVALVE VENEEUPIS PULLASTRA (MONTAGU) ON A SHELTERED BEACH IN WESTERN NORWAY, Tromso Mussum (Norway).

O. H. Johannessen.
Sarsia 53, p 41-48, 1973.

Descriptors: Europe, Population, *Aquatic populations, Beaches, *Shellfish, Analysis. Identifiers: *Norway, Bivalve, Venerupis-pullastra.

The population of Venerupis pullastra at just below mean low water of spring tides had a mean density of 31.0 individuals per 1/4 sq m in both 1968 and 1969. The following ratios were calculated: length/total weight, length/shell weight (length/weight of soft parts and shell weight/weight of soft parts. The dry weight of soft parts was 19.66% and the ash content 2.65% of the wet weight. The potential production of the population was 20 g ash-free dry weight/yr sq m, including a loss of 9 g due to mortality.—Copyright 1974, Biological Abstracts, Inc.

OPEN BEACHES (BILLS TO AMEND THE ACT OF AUGUST 3, 1968, RELATING TO THE NATION'S ESTUARIES AND THEIR NATURAL RESOURCES, TO ESTABLISH A NATIONAL POLICY WITH RESPECT TO THE NATION'S BEACH RESOURCES).

Committee on Merchant Marine and Fisheries (U.S. House).

Committee on Merchant Marine and Fisheries (U.S. House). For primary bibliographic entry see Field 6E. W75-00779

BOTTOM DRIFT DUE TO PERIODIC SHAL-LOW WATER WAVES, Hawaii Univ., Honolulu. Dept. of Mathematics. E. R. Spielvogel, and L. O. Spielvogel.

E. R. Spielvogel, and L. Q. Spielvogel. Journal of Geophysical Research, Vol 79, No 18, p 2752-2754, June 1974. 2 fig, 6 ref.

Descriptors: *Waves(Water), *Mathematical studies, *Sediment transport, Evaluation, Suspension, Movement, Model studies. Identifiers: *Periodic waves, Bottom drift, Irrotational flow, Buoyancy.

An analysis is presented for better understanding of the mechanism of transport of ocean bottom particles under the influence of periodic shallow water waves. The basic assumptions made are: the two-dimensional, periodic, permanent, irrotational waves in an incompressible inviscid fluid flow over a flat bottom; the density of the mixture and fluid are essentially the same; the suspended particles are mostly confined to a layer very close to the bottom; the particles essentially are naturally buoyant; and the nonlinear shallow water theory retains second-order terms. The mathematical analysis, checked with observations, shows that solitary wave models should not be used to predict results of long periodic waves. A departure is made from the previous work by removing the hypothesis that the particles remain in suspension all the time, and substituting the realistic hypothesis that particles are alternately stationary and in motion with the fluid. (Singh-ISWS)

PEAK DISTRIBUTION OF RANDOM WAVE-CURRENT FORCE, North Carolina State Univ. Raleigh. Dept. of Civil

North Carolina State Univ. Raleigh. Dept. of Civi Engineering. For primary bibliographic entry see Field 8B. W75-00757

CORRELATIONS BETWEEN SEASONAL RIVER DISCHARGE AND LOCAL LANDINGS OF AMERICAN LOBSTER (HOMARUS AMER-

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Water Yield Improvement—Group 3B

ICANUS) AND ATLANTIC HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS) IN THE GULF OF ST. LAWRENCE, Bedford Inst., Dartmouth (Nova Scotia). Marine

Ecology Lab.
W. H. Sutcliffe, Jr.

J Fish Res Board Can. Vol 30, No 6, p 856-859, 1973. Illus.

Identifiers: Age, Annual, Atlantic, Canada, Catch, *Discharge(Water), *Halibut, Hippoglossus-hippoglossus, Homarus-americanus, *Lobster, Maturity, Rivers, Seasonal, *Gulf of St. Lawrence.

Positive correlations are found between monthly discharge of the St. Lawrence River, Canada and annual regional catch of American lobster (Homarus americanus) and Atlantic halibut (Hippoglossus hippoglossus). Lag periods to account for age at maturity or commercial size permit such predictive possibilities.—Copyright 1974, Biological Abstracts, Inc.

GROWTH AND MORTALITY IN AN ARCTIC INTERTIDAL POPULATION OF MACOMA BALTHICA (PELECYPODA, TELLINIDAE), Manitoba Univ., Winnipeg. Dept. of Zoology. For primary bibliographic entry see Field 5C. W75-00788

DETERMINATION OF A NITROGEN-PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA, University of West Florida, Pensacola. Dept. of

Biology.
For primary bibliographic entry see Field 5C.

DERWENT ESTUARY FISH NETTING SURVEY

1972/73, Tasmanian Dept. of Agriculture, Hobart (Australia). Sea Fisheries Div. T. G. Dix.

Tasmanian Fisheries Research, Vol 8, No 1, p 11-19, March 1974. 4 tab, 3 ref, append.

Descriptors: *Surveys, *Fish populations, *Estuarine fisheries, Fish types, Fish harvest, Saline water fish, Estuaries, Water policy, Recreation, Regulation, *Australia.
Identifiers: *Derwent Estuary(Tasmania-Aust).

A systematic gill-netting survey of the Derwent Estuary, Tasmania, was carried out as a baseline study for future comparisons and an evaluation of the potential catch for amateur and commercial fishermen. Results are considered as catch in terms of species and area and size composition of catches of the most abundant species. They indicate little hope for further development of commercial gill netting in the estuary, but show the range of fish most likely to be caught by amateur fishermen, and allow an evaluation of legal minimum lengths. Some of the most commonly caught fish appear to be permanent residents of the estuary (flathead, cod), while others are known or probable migratory species (Australian salmon, sharks, snoek). These points are of significance in decisions on resource utilization, management and conservation of the Derwent Estuary waters. (CSIRO)

STUDIES ON THE PHYTOPLANKTON ECOLOGY OF THE TRONDHEIMSFJORD: III.
DYNAMICS OF PHYTOPLANKTON BLOOMS
IN RELATION TO ENVIRONMENTAL FACTORS, BIOASSAY EXPERIMENTS AND
PARAMETERS FOR THE PHYSIOLOGICAL
STATE OF THE POPULATIONS,
Trondheim Univ. (Norway). Biological Station.
For primary bibliographic entry see Field SC.
W75-01059

DIATOM FLORA OF THE GRAND RIVER, ON-TARIO, CANADA,

Waterloo Univ. (Ontario). Dept. of Biology. M. R. Sreenivasa, and H. C. Duthie. Hydrobiologia, Vol 42, No 2/3, p 161-224, 1973, Illus.

Descriptors: *Diatoms, Estuaries, Systematics. Identifiers: *Canada(Grand River-Ont).

This paper describes the diatom flora of the Grand River, Ontario, Canada. Samples were collected systematically from the river over a period of several years at 12 stations. The diatom flora of the river is typical of temperate alkaline rivers. The flora is rich in species and varieties, and is similar to that from many parts from North Eastern US. A total of 273 taxa of diatoms were identified. There is a tendency for the number of species per sample to increase downstream. The flora of the estuary is character 3rd by a great variety of taxa occurring in small numbers. Most of the species are alkaliphilous and in different in the halobian spectra.—Copyright 1974, Biological Abstracts, Inc.

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS BIBLIOGRAPHY: AB-STRACTED AND INDEXED, Plastics Technical Evaluation Center, Dover, N.J. For primary bibliographic entry see Field 5D. W75-00616

WATER PURIFICATION SYSTEM, Avec Corp., Cincinnati, Ohio. (assignee W. E. Johnson, and J. H. Fraser. U.S. Patent No 3, 813,892, 7 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol923, No 1, p 62, June 4, 1974.

Descriptors: *Patents, *Desalination, *Heat exchangers, Brines, Ice-brine systems, Sea water, Potable water, Cooling water. Identifiers: *Vaporization, Ice crystals.

A refrigerant is used to crystallize water, forming a slurry of ice crystals and brine. The slurry is fed to a wash column for separating the brine from the ice crystals. Ice is removed at one end of the column and brine and wash water is removed through an intermediate permeable port of the column. The ice is melted by indirect heat exchange with vaporized refrigerant. The pressure relationships at the input end of the ice bed, at the intermediate permeable port, and at the output end of the ice bed are controlled independently of the pressures at the crystallizer and at the melter units of the system, such pressures being capable of adjustment in accordance with the size of the ice crystals formed in the crystallizer to provide for maximum ice output from the column and minimization of wash liquid loss. (Sinha-OEIS)

3B. Water Yield Improvement

THE EFFECTS OF A WINTER DRAWDOWN ON AQUATIC VEGETATION IN A SHALLOW WATER RESERVOIR, Fisheries Research Lab., Eustis, Fla.

Fisheries Research Lab., Eustis, Fla. R. S. Hestand, and C. C. Carter. Hyacinth Control Journal, Vol 12, p 9-12, 1974. 1 fig. 3 tab. 10 ref.

Descriptors: *Drawdown, *Aquatic weed control, *Reservoirs, Shallow water, Florida, Winter,

Water level fluctuations, Water hyacinth, Alligatorweed.

Identifiers: Lake Ocklawaha(Fla), Coontail,

Hydrilla, Southern naiad, Brazilian elodea, Smartweed, Waterpurslane, Spatterdock, Pickerelweed, Eelgrass.

A two phase study was conducted on Lake Ocklawaha, Florida to determine the effects of a fall and winter drawdown on macrophyte communities. The first phase of the study involved the preparation of vegetational maps depicting the entire reservoir as it progressed through its pre-, during, and post-drawdown stages. A general overall view of effects of aquatic plant control could be observed and compared to the predictions made in 1972. The second phase consisted od documenting the response of selected aquatic macrophytes to water level fluctuations. Acreage of each plant species or community was computed from the maps using an area calculator. Five sites were chosen and carefully selected for a detailed study. The lake surface elevation was lowered 5 ft from September 1972 to February 1973. The May 1973 sampling indicated that the drawdown gave excellent control for contail, hydrilla, naiad, and Brazilian elodea, but there was a substantial increase in waterhycinth, alligator weed, smartweed, and waterpurslane. The rapid refill of the lake possibly could have been the main reason for the vegetation controlled. (Jones-Wisconsin) W75-00669

HYDROGRAPH ANALYSIS OF CARBONATE

AQUIFERS, Pennsylvania State Univ., University Park. Materials Research Lab. J. W. Hess, and W. B. White.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 075, \$4.75 in paper copy, \$2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Research Publication Number 83, June 1974. 63 p. 7 tab, 22 fig, 25 ref. OWRT B-046-PA(1). 14-31-0001-3638.

Descriptors: *Storm runoff, *Karst, Recharge, Rain gages, Water budget, Discharge(Water), *Kentucky, Feasibility studies, *Underground storage, Aquifer characteristics, Springs. Identifiers: *Limestone aquifer, Diffuse flow components, *Green River(Kent).

An evaluation of the feasibility of controlled storage of storm runoff in a karsted limestone aquifer was carried out using the aquifer of the Central Kentucky Karst as an example. The Mississippian limestone aquifer receives recharge from direct infiltration through sinkholes, from sinking streams, and from an overlying perched aquifer unit. Water is discharged through a sequence of springs along Green River. Regular observations of springs, a continuous monitoring of two of them, and a rain gage network in a series of catchment areas totaling 789 km sq permits an estimation of the water budget. Ten percent of the observed springs account for 95% of the total discharge of the aquifer; many smaller springs account for most of the remainder. Most of the water moves in a distinct system of conduits; the diffuse flow component in this aquifer is extremely small. Sharp input pulses from storms make useful probes of the aquifer. They indicate that the total residence time of recharge is about three weeks. The sytem drains quickly and long-term storage is very small. Springs respond to storm inputs in a matter of hours. Complex fine structure, particularly in conductivity records, can be interpreted as arrival times of discrete sources. Storage can be inserted and recovered very easily. W75-00697

STREAMFLOW REGULATION WITH PUMPED STORAGE RESERVOIRS,

Ohio Agricultural Research and Development Center, Wooster. For primary bibliographic entry see Field 4A.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B-Water Yield Improvement

W75-00796

COLLECTION OF ATMOSPHERIC DATA FOR PROJECT SKYWATER,

Soil Conservation Service, Denver, Colo.

J. N. Washichek.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 644-655, 1973. 7

Descriptors: *Snow surveys, *Precipitation gages, *Water yield, *Cloud seeding, Snowpacks, Precipitation(Atmospheric), Data Meteorological data, Colorado.
Identifiers: *Project Skywater.

A snow survey has been involved in the collection of atmospheric data since 1965 for the U.S. Bureau of Reclamation's 'Project Skywater.' This project is aimed at increasing the snowpack in key Rocky Mountain drainages to increase runoff and sub-sequently the available water supply. Snow courses range from 68.6 to 304.8 meters in length. Courses may be in the form of an X, an L, or a straight line. Ten or more sample points are established along the line of a snow course. Snow courses range in elevation from 1,980 to 3,250 meters; and excellent elevation relationship can be established. Precipitation gages used in conjunc-tion with pillows provide an excellent index at some locations whereas precipitation gages alone tend to measure less than actually falls. Manual measurements are accurate but time consuming and laborious in deep snow. It is necessary to keep close records of each point on each snow course to prevent measurement of drifts or hollows. Some manual measurements are needed to ascertain accuracy of pillows and precipitation gages. (See also W75-00809) (Knapp-USGS) W75-00856

MODIFICATION OF SNOW ACCUMULATION BY CLOUD SEEDING IN THE GREAT LAKES

BASIN, National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs

H. K. Weickmann.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1370-1375, 1973.

Descriptors: *Cloud seeding, *Weather modifica-tion, *Snowfall, *Great Lakes, Lake Erie, Artificial precipitation, Nucleation, Snow management.

The weather modification potential of the Great Lakes region is discussed. Numerous observations of artificial rain and snowfall have been made in the Buffalo region of Lake Erie. Climatologically, the Great Lakes region is peculiar in that its numerous relationships between the water surfaces and the air exert particularly strong influences in the atmospheric boundary layer. In winter the en-tire Great Lakes Basin has a high frequency of shallow cloud layers which, upon traveling across the still unfrozen and warm lakes, form the basic ingredient for the development of the storms. The basin is the seat of many industries whose pollu-tion potential affects not only the hydrology and ecology but also the weather. For instance, large concentrations of highly effective freezing nuclei have been formed downwind of the Bethlehem Street Plant in Lackawanna near Buffalo. These nuclei have released downwind snow showers on several occasions. The famous La Porte, Indiana, anomaly is another case of a possible pollution ef-fect. Shallow supercooled cloud layers form within the boundary layer. These cloud layers are generally 1700-1800 m thick and often have cloud top temperatures warmer that -15 deg C. Few natural freezing nuclei are active at these warm temperatures and consequently there is a poor natural release of precipitation. Precipitation from these clouds can be significantly increased through artificial seeding. (See also W75-00809) (Knapp-USGS) W75-00915

SNOW SURFACE MODIFICATION,

Colorado State Univ., Fort Collins.

J. Melman.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1376-1381, 1973.

Descriptors: *Snow management, *Cryology, *Snowmelt, Evaporation control, Water yield, Snowpacks, Melt water, Runoff, Snow cover, Water conservation, *Colorado, Rocky Mountain

Snow surface treatments to accelerate melt and reduce vaporization losses of snowpacks in the Colorado Rocky Mountain Front Range have been underway since 1964. Lampblack accelerates snow ablation by about 1.5 times that on untreated areas over a 20-day period on late-lying snowfields areas over a 20-day person on sate-lying snowness in the alpine area. Evaporation suppression on melting snow is a less promising treatment under the conditions studied, although it does appear to offer promise for certain situations. Long-chain alcohols can spread sufficiently on a melting snow surface to suppress evaporation. (See also W75-00809) (Knapp-USGS) W75-00916

SMALL OPENINGS IN POPLAR FOREST INCREASE SNOW ACCUMULATION,

Northern Forest Research Center, Edmonton (Alberta).

R. H. Swanson.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1382-1393, 1973. 4 fig. 1 tab. 3 ref.

Descriptors: *Snowpacks, *Snow management, *Forest management, Water yield improvement, Hydrogeology, Water balance, *Canada.

Deciduous forest canopy can be manipulated to alter snow accumulation patterns. In Streeter Experimental Basin in southwestern Alberta, four small openings in aspen receive one-third more snow than the surrounding closed canopy. This ratio persists throughout the melt season. These findings are combined with hydrogeological information to suggest a snow management scheme designed to improve onsite retention and use of snowmelt water. Rearranging a snowpack to occu-py less area may or may not be a desirable thing to do. If the soil under the snowpack is saturated or impermeable because of ice, then concentrations of meltwater are probably not wanted. On the other hand, if the localized melt results in more stable streamflow, then they probably are desired. (See also W75-00809) (Knapp-USGS)

SNOW FENCES FOR INFLUENCING SNOW ACCUMULATION,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experimental Station.

M. Matunein, Jr.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1394-1398, 1973.

Descriptors: *Snow management, *Avalanches, *Colorado, Snowpacks, Snow, Snow cornice. Identifiers: *Snow fences.

The efficiency of snow fences depends on height, density and length of fence, bottom gap, length and maximum depth of lee drift, cumulative effect of a set of tandem fences, tilting of fence, terrain effects, and contributing distance. The snow fence project on Mount Bethel in central Colorado is a practical example of how some of the above items were used to design and lay out snow fences intended to reduce the amount of wind-blown deposited in the starting zone of an avalanche that crosses an interstate highway. (See also W75-00809) (Knapp-USGS) W75-00918

RELATION OF WIND EXPOSURE AND FOREST CUTTING TO CHANGES IN SNOW ACCUMULATION,
Forest Service (USDA), Moscow, Idaho. Forestry

Sciences Lab. H. F. Haupt.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1399-1409, 1973. 3 fig. 2 tab, 15 ref.

Descriptors: *Snow management, *Forest management, *Water yield improvement, Snow cornice, Snowpacks, Snow cover, Forestry,

The potential for utilizing wind exposure to augment the amount of snow trapped in a steep, clear-cut opening is under investigation in northern Idaho. The experiment has demonstrated that an excess of snow will drift into a sizable cornice to the lee of an open, treeless ridge, if the trees are removed downslope on the windward slope. Development of the cornice appears to be related to the width of the windward opening at the point where it intersects the ridge top. Based on these where it intersects the hoge top. Based on these early results, two alternatives are proposed for managing snow on tree-covered slopes slopes adjacent to a major ridge. If the goal is to accumulate more snow in north-facing (leeward) openings, then large complementary (windward) openings would be adequate. But, if the objective if to keep snow in place and preserve potential moisture on windward slopes, then a belt of trees should be retained to separate a windward opening from the ridge top; these trees would serve as a wind barrier. (See also W75-00809) (Knapp-USGS) W75-00919

A THEORETICAL STUDY OF ICE SURFACE DUSTING INFLUENCE ON MELTING INTEN-

Akademiya Nauk SSSR, Moscow. Institut Geografii.

Geogram.

I. A. Zotikov, and G. P. Moiseeva.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1410-1420, 1973.

Descriptors: *Melting, *Ice, *Snowpacks, *Ice cover, Albedo, Snowmelt, Dusts, Water yield, Water yield improvement, Heat balance, Solar radiation, Heat budget, Mathematical models.

Dusting of ice surfaces changes the intensity of melting mainly because of the change in albedo. A simple model of the heat exchange mechanism within a melting layer was constructed to calculate the influence of dusting. Formulae were obtained to calculate the change of albedo and intensity of surface melting due to dusting. Comparison of the theory and the experiments showed good agreement in the results obtained. (See also W75-00809) (Knapp-USGS) W75-00920

POSSIBILITY OF ARTIFICIAL AUGMENTA-TION OF MELTING BY SURFACE DUSTING

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

OF GLACIERS (RESULTS OF SOVIET IN-VESTIGATIONS), Akademiya Nauk SSSR, Moscow. Institut

Akademya
Geografii.
V. M. Kotlyakov, and L. D. Dolgushin.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1421-1426, 1973.

Descriptors: *Water yield improvement, *Melting, Fellaciers, *Ice, Snowpacks, Snowmelt, Water yield, Heat balance, Solar radiation, Heat budget. Identifiers: USSR.

Dusting of snow and ice surfaces by a dark material causes an increase in the rate of melting. This method can be used to prolong the growing season for agriculture, to clear mountain passes and air runways earlier than normal, to make channels in arctic ice, to destroy ice dams on rivers, and to increase runoff of melt water from glaciers for irrigation purposes. In field and laboratory experiments on increasing glacier melting, the amount of additional melt water yielded depended on the natural pollution of ice and snow surfaces, on the extent of dusting, on weather conditions prior to and after the experiment, and also on the size and position of the experimental area on the glacier. At the same rates of dusting the increase of melting on clean firn in the accumulation areas of glaciers is more than that on the polluted glacier tongues. (See also W75-00809) (Knapp-USGS) W75-00921

IMPACT OF SNOWPACK MANAGEMENT ON

SNOW AND ICE HYDROLOGY, Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

W. E. Howell.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1464-1472, 1973.

Descriptors: *Snow management, *Weather modification, Snowpacks, Snow cover, Snowfall, Cloud seeding, Forest management, Social aspects, Legal aspects, Water balance, Planning.

Snowpack management, although still a primitive technology, is economically effective in ap-propriate settings. Applications are limited by meteorological, technological, and practical con-straints set by the efficiency of natural snowfall processes that indicate average seasonal modifications of 10 to 20 percent. Economic, ecological, social, and legal constraints forbid applications that aggravate extremes. Estimated effects of snowpack management are given on snow and ice parameters useful to planners. In the absence of parameters useful to planners. In the absence of effective Federal policy in the United States, there is a trend toward State initiative in weather modifi-cation operations. (See also W75-00809) (Knapp-USGS) W75-00925

THE INFLUENCING OF AGGREGATE STA-BILITY, PLASTICITY AND WATER RETEN-TION IN SOIL STABILIZATION WITH MEDI-ION IN SOLD STABLIZATION WITH MEDI-UM AND HIGH APPLICATIONS OF CALCIUM HYDROXIDE, (IN GERMAN), For primary bibliographic entry see Field 2G. W75-01048

DEFIH OF PENETRATION OF THE ROOTS OF SOME EDIFICATORS IN NATURAL PHYTOCENOSES OF THE DESERT IN THE ALMA-ATA OBLAST, (IN RUSSIAN), Kazakhskii Gosudarstvennyi Selskokhozyaistvennyi Institut, Alma-Ata (USSR). For primary bibliographic entry see Field 21. W75-01078

3C. Use Of Water Of Impaired Quality

AN INVESTIGATION OF THE RETURN FLOW FROM IRRIGATED LAND,
Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 5B. W75-00698

EXPERIENCES IN THE CONSTRUCTION AND OPERATION OF DAMS IN SALINE ENVIRON-

Western Mining Corp. Ltd., Perth (Australia). For primary bibliographic entry see Field 8A. W75-01015

DRAINAGE EXPERIMENTS ON PEAT SOIL IN VESTERALEN, (IN NORWEGIAN), Statens Forsoeksgard Vagoenes, Bodoe (Norway). H. Halvorsen.

Forsk Fors Landbruket. Vol 24, No 4, p 277-293. 1973. Illus. English summary.

Descriptors: Europe, *Drainage, *Bogs, Peat, Surface water, *Furrow drainage, Surface drainage, Soil moisture Identifiers: Ditching, *Norway(Vesteralen).

Results are presented of 3 drainage experiments for the years 1958-1964 in Vesteralen, in the county of Nordland, Norway. All 3 experiments were carried out on uncultivated peaty bog layer, resting on a subsoil of stony moraine, everywhere at least 1.3 m deep, and showing an average degree of humification from 3.4-6.8 on von Post's scale. Measurements of the degree of acidity before cultivation began gave pH values from 4.3 to 5.3. The experiments included 2 types of closed drains, hand-dug terraced drains (peat drains) 90-120 cm deep, alone or in combination with 60 cm deep drains made by Nakor Olsen's ditching plow. For the hand-dug drains intervals varying from 5-20 m were tried, while those for the 'Nakor' drains varied from 2-6 m. Two different methods were tried, plowing to a depth of 30 cm, and simple rotary-howing, and 2 different ways of leveling the strips between the drains, with flat surface or with curved surface falling towards the adjacent drains. The yield increased as the distance decreased down to 8-10 m between the main drains (terraced). The bearing capacity of the land ap-peared to increase all the way down to the smallest interval that was tried, 5 m. The supplementary 'Nakora' drains gave greatly varying yield results, presumably due to soil variation. As a method of reclaiming the land, rotary-hoeing gave the best results, with 24% greater yield than plowing, if the average for all the years is taken. The ground-water was on the average 5.6 cm deeper after rotary-hoeing than after plowing. The positive effect on the 'ridges' was insufficient to outweigh the negative effect in the 'valleys.' The method will presumably prove advantageous under practical

3D. Conservation In Domestic and Municipal Use

conditions provided the 'valleys' are sufficiently well designed with channels for the surface water.--Copyright 1974, Biological Abstracts, Inc. W75-01057

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, METROPOLITAN AREA, 1972, Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.

METHOD FOR EVALUATING WATER RESOURCES FOR URBAN PLANNING. Geological Survey, Reston, Va. Urban Water Program. For primary bibliographic entry see Field 6B.

FORECASTING WATER DEMAND IN WYOM-ING WITH THE MAIN II SYSTEM, Wyoming Univ., Laramie. Water Resources Research Inst. For primary bibliographic entry see Field 6D. W75-00700

URBAN WATER RESOURCES PLANNING AND MANAGEMENT, North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B.
W75-00983

CONCEPTUAL ASPECTS OF WATER REUSE, Netherlands Waterworks, Rijswijk. Testing and Research Inst. For primary bibliographic entry see Field 5D.

MODELS AND METHODS APPLICABLE TO CORPS OF ENGINEERS URBAN STUDIES. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 6A. W75-01001

WATER SUPPLY AND SEWERAGE SYSTEMS PLANNING PROGRAM, Black River-St. Lawrence Regional Planning Board, Canton, N.Y. For primary bibliographic entry see Field 5D. W75-01004

3E. Conservation In Industry

TESTIMONY OF MEMBERS OF CONGRESS AND OTHER INDIVIDUALS AND ORGANIZA-TIONS ON PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENER-GY COMMISSION APPROPRIATIONS, 1975. Committee on Appropriations (U.S. House). For primary bibliographic entry see Field 6E. W75-00727

STRIP-MINE REGULATION AND RECLAMA-TION: AN ATTITUDE SURVEY, Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Economics. For primary bibliographic entry see Field 6B. W75-01028

3F. Conservation In Agriculture

SURVEYS OF TREE AND HEDGE SHELTER IN MID CANTERBURY: A SUMMARY OF RESULTS. Department of Scientific and Industrial Research,

Christchurch (New Zealand). Crops Research Div. J. W. Sturrock. N Z J Exp Agric. Vol 1, No 1, p 105-107. 1973.

Descriptors: *Shelter belts, Windbreaks, *Trees, Farms, Arable land, Australia. Identifiers: *Hedge shelters, *New Zealand, *Tree shelters.

Hedge and tree shelter was studied in 2 sample areas, each of 13.4 sq km, representing contrasting regions of farmland on the mid Canterbury plain New Zealand. Studies showed that hedges and

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

trees cover 1.3% of the land and protect only about 20% of it; estimates from other areas have shown that about 5% of the land must be in trees for proper protection of agricultural areas.--Copyright 1974, Biological Abstracts, Inc.

DRIFT OF TERRESTRIAL ARTHROPODS IN AN IRRIGATION CANAL FOLLOWING WIDE-AREA APPLICATION OF U MALATHION,

Nebraska Univ., Lincoln. Dept. of Entomology. For primary bibliographic entry see Field 5G.

RELATIONS BETWEEN ALPHAAMYLASE AC-TIVITY AND GROWTH OF RICE SEEDLINGS. Agricultural Extension Service, Yuba City, Calif. J. F. Williams, and M. L. Peterson Crop Sci, Vol 13, No 6, p 612-615, 1973. Illus.

Descriptors: *Rice, Plant growth, *Planting management, Reproduction, Grains(Crops), Crop production, Cereal crops, Agronomic crops, Field

A study was made of possible relationships between alpha-amylase activity (referred to as 'activity') and rice (Oryza sativa L.) seedling vigor, particularly as to stand establishment from water-sown seeds. Relationships between activity and seedling weight (wt) during germination were noted for different cultivars and under different temperature and O2 conditions. The r values for activity X wt for 'IR-8' and 'Italica Livorno' were highly significant (0.99 and 0.96, respectively) in the 3rd-11th days of germination. These 2 cultivars differed widely in seed weight, enzyme activity and seedling weight increases. The r value among 20 cultivars was 0.60, significant at the 0.05 level. The range in activity units (AU) was from 121.2 (for Italica Livorno) to 16.2 (for 'Colusa'). A comparison of activity units at 30C on rice germinated on moist blotters, under water, and in a N2 at-mosphere showed that submergence had little effect on activity but the O2-free atmosphere cut AU in half. These same conditions greatly sup-pressed seedling weights. Low temperatures (18C) severely reduced AU and weight. Alpha-Amylase activity was not an important limitation to seedling development of water-sown rice under cold-water conditions.--Copyright 1974, Biological Abstracts, Inc W75-00690

ON THE CHARACTERISTIC CLIMATE AND ITS INFLUENCE ON THE CROP PRODUCTION IN 1971, (IN JAPANESE), Meiji Univ., Kawasaki (Japan). Faculty of

Agriculture. S. Komiya.

Bull Fac Agric Meiji Univ. 29. p 105-136, 1972. English summary.

Descriptors: Asia, Climates, Plant production, *Climatic data, Weather, *Crop production. Identifiers: *Japan.

Climatic characteristics in various regions of Japan for 1971 are described. Rice production was the lowest since 1955. Autumn vegetables were poor due to cloudy and cold weather. Late spring pool damaged fruit and other crops in some dis-tricts and heavy hail damage occurred in mid summer in Chubu and Kanto.—Copyright 1974, Biological Abstracts, Inc.

PHILIPPINE CROP OCCURRENCE ACCORD-PHILIPPINE CROP OCCURRENCE ACCORD-ING TO CORONAS CLIMATE TYPES: PRELIMINARY RESULTS, Philippines Univ., College. Dept. of Soils. W. R. Philipson, M. F. Layese, and J. A. Mariano. Philipp Agric. Vol 56, No 1/2, p 48-58, 1972. Descriptors: Climates, Asia, *Crop production, Rainfall, *Rainfall intensity, Distribution patterns, Plant response. Identifiers: Coronas, *Philippine Islands.

A survey of 30 provinces investigated the extent to which patterns of rainfall distribution, as defined by the 4 Coronas climate types, reflect patterns of crop occurrence. The data obtained from each province consisted of: the predominant, major, and secondary crops on each soil unit, the degree to which each soil unit is cultivated and the climate type under which each soil unit occurs. The findings point to a definite interaction between rainfall distribution and crop occurrence. Each Coronas climate type exhibits characteristic crops as well as characteristic soil-cropping intensities of like crops. The applicability of the Coronas system for partitioning cropping patterns is supported by the correspondence between trends in crop occurrence and the defined trend in climate types.--Copyright 1974, Biological Abstracts, Inc. W75-00756

BEHAVIOR OF SOME FOREIGN ALFALFA VARIETIES UNDER IRRIGATION IN FUNDU-LEA, (IN RUMANIAN), Institutul de Cercetari Pentru Cereale si Plante

Tehnice, Fundulea (Rumania).

L. Gumaniuc.

An Inst Cercet Cereale Plante Teh Fund Ser C Amelior Genet Fiziol Tehnol Argric. 38. p 323-329, 1972. English summary.

Descriptors: Europe, Plant growth, *Alfalfa, Field crops, *Crop response, *Irrigation. Identifiers: *Romania.

A number of 43 foreign alfalfa varieties were tested during 1965-1968 and 1969-1970 for green and dry matter production, crude protein, leaf percent, plant height as well as overwintering and disease resistance. In the Romanian climate, foreign varieties exhibited a weak resistance both to overwintering and summer atmospheric dryness. For this reason their green and dry matter production proved to be smaller under irrigation, as compared to the Romanian 'H 652'. Fast-growing cultivars from Italy and France may be used as parents in special breeding works.--Copyright 1974, Biologi-cal Abstracts, Inc.

PERFORMANCE OF COMMERCIAL MAIZE HYBRIDS UNDER IRRIGATION ON THE DARLING DOWNS AND THE ST. GEORGE IR-

RIGATION AREA,
Department of Primary Industries, Brisbane (Australia).

R. B. Brinsmead, N. E. Delaney, G. R. Stevens, and B. D. Hall. Queensl J Agric Anim Sci. Vol 30, No 1, p 9-15.

Descriptors: Irrigation, Irrigation practices, *Furrow irrigation, *Corn(Field), *Cereal crops, *Sweet corn, *Australia, *Crop response. Identifiers: Hybrids, Maize, Queensland(Aust).

Twenty-one dent and 2 pop types of maize hybrids were grown under furrow irrigation in some or all trials from the 1965-66 to the 1969-70 summer season. Q23, DS601, GM211, Q1280, GH134, GH128, Q692 and Q724 showed average performances above the trial mean yields. The recently introduced hybrids DeKalb 805A, Pioneer Q500 and DeKalb XL45 were not as comprehensively tested but gave very promising per-formances. Lodging resistance was superior in these latter types. Days to 50% silking, lodging in-cidence, 1000 grain weight grain N data are presented.—Copyright 1974, Biological Abstracts, Inc. Inc. W75-00783

WATER MANAGEMENT THROUGH IRRIGA-TION AND DRAINAGE: P PROBLEMS, AND OPPORTUNITIES. PROGRESS. For primary bibliographic entry see Field 4A. W75-00964

IRRIGATION DESIGN REQUIREMENTS FOR CORN, Nebraska Univ., Lincoln. Dept. of Agricultural

Engineering.
P. E. Fischbach, and B. R. Somerhalder.
Transactions of the ASAE, Vol 17, No 1, p 162165, February 1974. 2 fig, 5 tab, 7 ref.

Descriptors: *Irrigation design, *Corn(Field), *Water management(Applied), *Estimating, Water quantity, Irrigation practices, Irrigation water, Rainfall, Root zone, *Sprinkler irrigation, Soil moisture, Clay loam, *Nebraska, *Design

Identifiers: *Crop vield, Irrigation frequency.

Automation of sprinkler irrigation has reduced labor requirements and thus costs. Without the constraint of labor costs, new design criteria are needed to determine how much water to apply at each irrigation and how often to apply the water. Water must be applied efficiently in relation to rainfall for purposes of conservation and to leave room in the soil profile for the potential rainfall to follow. Reported is a study aiming to: (1) determine how much water is required to produce high corn yields with frequent, relatively light water application; (2) determine irrigation system capacity needed for high corn yields on a deep silty clay loam soil as related to the system's capabilities of applying water use rate at the peak daily water use rate per day and at fractions of it per day; and (3) examine the soil moisture extraction pattern of corn under various irrigation frequencies and amounts of water applied. The site selected for study was a 7 acre field at the University of Nebraska Field Laboratory, Mead, Nebraska. Results are discussed in detail. (Bell-Cornell) W75-01007

TUNNEL EROSION--A FIELD STUDY IN THE

Soil Conservation Service, New South Wales (Australia) For primary bibliographic entry see Field 4D. W75-01011

EFFECT OF PREVIOUS WATER STRESS ON ION UPTAKE AND TRANSPORT IN BARLEY

SEEDLINGS, Technische Hochschule, Darmstadt (West Germany). Botanisches Institut.

rimary bibliographic entry see Field 21. For primar W75-01013

WATER SHORTAGE AND AGRICULTURE:

SOME RESPONSES, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry. C. T. Gates

Journal of the Australian Institute of Agricultural Science, Vol 40, No 2, p 121-142, June 1974. 13 fig,

*Reviews, *Moisture Descriptors: *Drought tolerance, *Plant physiology, *Crop response, *Dry farming, Water shortage, Fertilisa-tion, Semiarid climates, Varieties, Water require-ments, Plant growth, Adaption, Irrigation efficiency, Cloud seeding, Forecasting, Nutrient requirements, Droughts.

A literature review and some experimental results are presented with the purpose of trying to bring together practical information relevant to the problems of water shortage and analyzing them in sufficient detail to reach useful conclusions. The

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effects of water stress on mineral nutrition and their consequences for fertilizer practice, the differences between plants in their adaptability to climatic variations, and the metabolic and physiological basis of responses to water stress, are considered in detail. Needs for research into irrigation practices, management for optimum utilization of natural rainfall, rainmaking and drought forecast-ing are discussed. It is emphasized that the responses of plants to moisture shortage, and particularly their ability to utilize other resources in conditions of moisture stress, is fundamental to agricultural systems in which the supply of water is a limiting factor. In particular, the assumption that droughthardy species are necessarily poor producers under favorable conditions is questioned: more attention should be paid to the study of their efficiencies in metabolic use of water. (CSIRO) W75-01014

COMPARISON OF CURRENT CHEMICAL METHODS FOR EVALUATING IRRIGATION SOILS,

Commonwealth Scientific and Industrial Research Organization, Canberra, (Australia).
For primary bibliographic entry see Field 2G.
W75-01027

AGRICULTURAL STATISTICS, ARIZONA (1973). Arizona Crop and Livestock Reporting Service,

Phoenix. Bulletin S-9, April, 1974. 71 p.

Descriptors: *Agriculture, *Arizona, *Crop production, *Farm prices, *Livestock, Irrigated land, Soil moisture, Statistics, Cattle, Cotton, Federal government, Gross income, Lettuce, Rainfall, Range grasses, Temperature.

Identifiers: Cash receipts.

In 1973, for the first time, cash receipts from Arizona's agricultural products exceeded a billion dollars--\$154 million higher than 1972, resulting from higher prices and production. Principal con-tributors to this large gross were cattle and calves, generating \$392 million, cotton fiber and seed, \$138 million, and lettuce, \$53 million. Livestock and livestock products accounted for 57% of the gross, with about 40% attributable to crop produc-tion. Crop receipts generally were up 19% over 1972, livestock production increased 21% and farm production costs were sharply higher also. A cool, wet spring provided good soil moisture in 1973, a dry mid-summer afforded an excellent period for growth and development of crops and range grasses, while the fall was generally dry and range conditions deteriorated as temperatures fluctuated. Agricultural statistics for each county, county estimates of acreage and production for all major Arizona crops and for livestock are supplied. Three-year county summaries of crop and live-stock products, receipts, and government payments are included. Voluntary figures pro-vided by ranchers, farmers, and agricultural businessmen furnish the primary data for this 9th an-nual report. Tables supply information on planting and harvesting dates, temperature, precipitation, land status, and reservoir storage. (Gloyd-Arizona) W75-01029

IRRIGATION SYSTEM, BRRIGATION STSTEM, Boyle and Osborn, Lockport, N.Y. (assignee) R. O. Osborn, and D. G. Boyle. U.S. Patent No. 3,830,067, 5 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 925, No 3, p 788, August 20, 1974.

Descriptors: *Patents, *Water supply, *Irrigation systems, Subsurface irrigation, Water distribution((Applied), Equipment, Conduits, Tubes.

An irrigation system employs a novel flexible tub-ing for the distribution of water, particularly in a

subsurface irrigation system. The tubing, having at least a portion of the surface composed of a permeable, fibrous material through which water may pass at a slow, controlled rate with a negligi-ble pressure drop through the system, is inexpensive to manufacture and install and is capable of confining the delivered water to the desired areas only. The tubing is characterized as a tubular body formed by joining together along their longitudinal edges only, a plurality of elongated flexible strips of plastic or other suitable material. At least one of the strips is composed of a permeable, fibrous material, preferably a non-woven fabric, capable of slowly passing a liquid, such as water, or a gas. Another of the strips may be solid and impervious or may be formed of the same or a different permeable, fibrous material. (Sinha-OEIS W75-01033

CHANGES IN THE CONTENTS OF CALCIUM LACTATE SOLUBLE POTASSIUM AND PHOSPHORUS IN UNTILLED AND TILLED SOILS DURING A GROWTH PERIOD, (IN GER-

Goettingen Univ. (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung. W. Ehlers, G. Pape, and W. Boehm. Z Pflanzenernaehr Bodenkd Vol 133, No 1/2, p 24-

36, 1972, Illus. English summary.

Descriptors: *Soils, Cultivated lands, Cultivation, Fallowing, Potassium, Phosphorus, *Gray-brown podzolic soils, *Podzols, *Soil chemistry, Soil properties, Soil chemical properties, Nutrients, Soil analysis, Calcium compounds. Raphanus-sativus, Identifiers:

Identifiers: Avena-sativa, *Calcium leachate.

Changes in the contents of K and P, soluble as calcium lactate, were investigated in different soil depths of a conventionally tilled plot and a com-parative plot untilled for 5 yr. The soil is a Grey Brown Podzolic Soil (Typudalf) derived from loess. Results are reported of the growing season in 1970 with oats (Avena sativa L.) and the following green-maturing crop fodder-radish (Raphanus sativus L.). Nutrient uptake by oats was investigated. Contents of K and P in the soil changed; the largest changes were noted in the upper soil layer from 0 to 2.5 cm depth as a function of nutrient uptake, weather conditions, and manuring. Contents of K and P in all soil depths decreased from May until the end of July. When oats mature at the beginning of Aug., they increase again. On the untilled plot the contents in the soil layer 10 to 20 cm rose temporarily from the middle of June to July. The K content of the tilled soil layer from 0 to 20 cm depth decreased from 'high' in May to 'medium' in June. There exist positive correlations in all soil layers of the tilled plot between the content of calcium lactate soluble-K and the mean value of soil water content; this is true only for the layer 30 to 50 cm of the untilled plot. During 5 yr of no-tillage the surface applied K penetrated 10 cm, while P penetrated only 5 cm into the soil. The surplus-concentration of calcium lactate soluble-K and P-in the upper soil layers of the untilled plot corresponds to 186 kg K and 34 kg P/ha as compared to the tilled plot. Higher differences in concentrations of the relatively immobile nutrients K and P were confirmed not only from one soil segment to the next in the vertical direction of the untilled plot but also in the horizontal direction, as compared with the tilled plot.--Copyright 1974, Biological Abstracts, Inc. W75-01047

ECOLOGICAL FACTORS LIMITING EPIDEMICS OF HOP DOWNY MILDEW IN ARID CLIMATES, Florida Univ., Fort Pierce. Inst. of Food and Agricultural Science. R. M. Sonoda, and J. M. Ogawa. Hilgardia. Vol 41, No 15, p 457-473. 1972. Illus. Identifiers: "Arid climates, Diurnal, "Ecological studies, "Epidemics, Humidity, "Mildew(Hop

downy), Moisture, Sporangial, Temperature, *California(Sacramento Valley).

Factors affecting the development of hop downy mildew during the dry, hot season in the Sacramento Valley, California, are reported. In flood-irrigated commercial hop yards, systemically in-fected shoots (which can be sources of inoculum) were present until late in the growing season. Dew and guttation fluid appeared on leaves and stems at the base of the plants after irrigation, but only a few lesions developed on the leaves. Data from Hirst spore traps, used to monitor the concentra-tion of sporangia near systemically infected shoots, indicated a diurnal pattern of sporangial release. Sporangia were released with each sudden lowering of RH (relative humidity) under laboratory conditions, and a more rapid lowering resulted in greater release. Sporangial release in the field coincided with RH drop. Most of the sporangia were released in the early morning during evapora-tion of dew and guttation fluid, and few sporangia were collected in the afternoon, evening, or night. Longevity of viable sporangia was dependent on RH, RH below 60% killed sporangia in less than 3 h. Even in well-irrigated yards the ambient RH remained below 60% for about 10 h each day; most sporangia do not survive throughout the day in such an environment. A few sporangia do survive on hop leaf surfaces through favorable RH conditions, and they initiate infection during the following dew period. Sporangia exposed to temperatures of 36, 39, and 42C had delayed germination when subsequently placed in environments op-timum for germination (temperatures of exposed leaves in the yards occasionally exceed 33C during the day). Both inoculum and free moisture are present in the yards and can establish new infections, but they do not occur concurrently long enough to start epidemics. In the event of summer rains, however, even these few infections can provide sufficient inoculum for an epidemic.--Copy-right 1974, Biological Abstracts, Inc. W75-01051

SPRINKLER-INDUCED SOIL TEMPERATURE CHANGES UNDER PLANT COVER,

Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. R. A. Kohl.

Agron J. Vol 65, No 6, p 962-964. 1973. Illus. Identifiers: *Irrigation, *Soil temperature, Solanum-tuberosum, *Sprinkler irrigation, Plant

An experiment was conducted to determine the amount of soil temperature reduction to be expected from irrigating potatoes (Solanum tu-berosum) at various intervals. Soil temperatures were measured at the 10-cm depth under potato ridges with various amounts of plant cover. The mean daily soil temperature at the 10-cm depth in a sit loam soil after 7 days following irrigation in-creased as much as 2C above the daily irrigated plot with full cover and 4C above the daily irrigated plot without cover. Similar soil tempera-ture increases occurred in a loamy fine sand soil irrigated after 5 days which is the normal irrigation intervals for these soils.--Copyright 1974, Biological Abstracts, Inc. W75-01054

EFFECT OF GRAVEL MULCH ON CROP

Agricultural Research Service, Fort Collins, Colo. M. L. Fairbourn.

Agron J. Vol 65, No 6, p 925-928, 1973. Illus. Identifiers: Corn(Field), *Crop yield, Evapora-tion, *Gravel mulch, Soils, Sorghum, Soybeans, Storage, Temperature, Tomatoes, Semi-arid regions, Soil water.

A study was established to determine if mulch material might be used to promote increased crop yields from the precipitation of semiarid regions. Treatments of gravel mulch, cornstalk mulch, and

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a control of bare soil were used in both laboratory and field experiments to observe their effect on soil water, soil temperature and plant response. Evaporation of soil water was less and soil temperatures were higher under gravel mulch as com-pared with a bare soil surface. Increased crop (corn, sorghum, tomatoes and soybeans) yields on the gravel-mulch treatment appeared to be due to an interaction of more soil water and higher soil temperature. Bare soil strips for crop rows and annual regeneration of the gravel mulch were necessary management practices to permit both crop production and maintenance of an effective mulch. Gravel mulch not only promotes increased crop yields but also has a potential for mechanized application and maintenance.--Copyright 1974, Biological Abstracts, Inc. W75-01066

AGRICULTURAL TECHNIQUES OF RAISING GREENERY PLANTATIONS UNDER THE CON-DITIONS OF NORTHERN KAZAKHSTAN, (IN RUSSIAN). For primary bibliographic entry see Field 2G.

W75-01072

ANATOMIC AND MORPHOLOGICAL CHARACTERISTICS OF CUCUMBER AND TO-MATO ROOTS UNDER HYDROPONIC CONDI-TIONS, (IN RUSSIAN), For primary bibliographic entry see Field 2I.

CHARACTERISTICS OF WATER REGIME AND PRODUCTIVITY OF VEGETABLE CROPS WITH DIFFERENT MINERAL NUTRITION, (IN RUSSIAN),

A. M. Stolyarov Fiziol Biokhim Kul't Rast, Vol 5, No 4, p 416-422, 1973, English summary.

*Transpiration, *Fertilizers. Photosynthesis, *Vegetable crops, Tomatoes, Cucumbers, Cabbage.

Inorganic fertilizers affect considerably the water regime of plants, transpiration intensity, productivity of photosynthesis and yield of vegetable crops, tomato, cucumber and cabbage. When introducing fertilizers only at the early stage of vegetation, the content of water decreases and transpiration intensity increases. With plant growth and development the water supply of the plants increases and transpiration intensity decreases the increase in water occurring mainly at the expense of a rise of strongly bound water. Higher yield corresponded to higher water con-tent.--Copyright 1974, Biological Abstracts, Inc. W75-01095

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

AQUATIC WEED MANAGEMENT IN THE FINGER LAKES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 5G. W75-00554

CONTINUED EFFECTS OF TROPICAL STORM AGNES (1972) ON AQUATIC WEED GROWTH, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 5G. W75-00555

FLOOD HYDROGRAPH SYNTHESIS FOR RURAL PENNSYLVANIA WATERSHEDS, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2A. W75-00557

THE RELATIONSHIP OF WATER QUALITY TO LAND USE AROUND LAKES.
East Central Florida Regional Planning Council,

For primary bibliographic entry see Field 5G. W75-00560

BIOLOGY OF EXCESSIVE WEED GROWTH IN THE HYDROELECTRIC LAKES OF THE WAIKATO RIVER, NEW ZEALAND, V. J. Chapman, J. M. A. Brown, C. F. Hill, and J. L. Carr.

Hydrobiologia, Vol 44, No 4, p 349-363, 1974. 8 fig, 4 tab, 12 ref.

Descriptors: *Biology, *Aquatic weeds, *Plant growth, Aquatic weed control, Lakes, Growth rates, Nutrients, Arsenic compounds, Light intensity, Light quality, Stagnant water, Photosynthes-

Identifiers: *Waikato River(New Zealand), Ceratophyllum demersum, Lagarosiphon major, Egeria densa, Elodea canadensis.

In January 1965, the Ohakuri power station was closed for a few days because the turbine screens were blocked by Ceratophyllum demersum in quantities too great for the cleaning machinery to clear. Three years later a similar massive accumulation of Lagarosiphon major caused a closedown of the Aratiatia station. Similar situations occurred elsewhere. A study was commenced of the biology of the weeds in the Waikato hydro-electric lakes. There are four major exotic weeds, Ceratophyl-lum, Lagarosiphon major, Egeria densa and Elodea canadensis, all of which form extensive beds. The first three have appeared in the lakes only since 1960, but Elodea was probably present earlier. Studies of Lagarosiphon, Egeria and Ceratophyllum have enabled the water tempera-ture range, compensation points and certain nutrient requirements to be established under New Zealand conditions. Significant regions in the upper Waikato River are highly thermal and these waters are rich in arsenic which the weeds accumulate; value of over 1000 ppm dry wt have been recorded, making them unsuitable for stock feed. Ceratophyllum and Lagarosiphon both appear to be shade plants, the former existing in the coarse winter form and finer summer form. Limnological data affecting the growth of these weeds is given. (Jones-Wisconsin) W75-00590

WATER RESOURCES OF THE ST. LOUIS AREA, MISSOURI, Missouri Geological Survey and Water Resources,

Rolla. For primary bibliographic entry see Field 4B. W75-00621

THE AVAILABILITY OF WATER IN THE LIT-TLE LOST RIVER BASIN, IDAHO, Geological Survey, Lakewood, Colo. A. Clebsch, Jr., H. A. Waite, and S. O. Decker. Idaho Department of Water Resources, Boise, Water Information Bulletin No 37, July 1974. 60 p, 14 fig, 8 tab, 28 ref.

Descriptors: "Water resources, "Idaho, "Groundwater, "Surface waters, "Water yield, Hydrogeology, Alluvium, Basalts, Water balance, Hydrologic data. Identifiers: "Little Lost River Basin(Idaho).

The water resources of the Little Lost River basin, Idaho, are described. The basin is an elongated,

northwest trending, intermontane valley, which drains an area of about 900 square miles near the northwestern edge of the Snake River Plain. The northwestern edge of the Snake River Plain. The principal aquifers are highly transmissive alluvial fill in the middle and upper valley and alluvial fill interfingered with basalt in the southernmost part of the valley. The average annual precipitation is about 8 inches near Howe, and a precipitation-altitude relation, developed from meager rainfall and snowcourse data, indicates that in the mountaine at the state of tains at about 9,000 feet, precipitation is on the order of 40 inches. Yield based on the 'perimeter-inflow' method is estimated at 271,000 acre-feet per year. Groundwater in the basin occurs under water-table conditions and is intimately related to surface flow. Transmissivity values for the alluvial aquifer range from about 150,000 to 1,000,000 gallons per day per foot. The storage coefficient is on the order of 0.15 to 0.2. An estimated 28,000 acre-feet of surface water, and 40,000 acre-feet of groundwater are consumed annually for irrigation. Phreatophytes are estimated to use 36,000 acrefeet. As of 1966, there has been no long-term depletion of groundwater storage. Although water levels in the lower basin declined for several years in the late 1950's and early 1960's, they recovered in 1965 in response to the high runoff of that year and the infiltration of applied water. Average outflow from the basin is about 167,000 acre-feet, of which an estimated 157,000 acre-feet is ground-water. The total quantity of groundwater in storage is on the order of 6.3 million acre-feet. (Knapp-USGS) W75-00629

MODIFICATION OF ROUTED STREAMFLOW BY CHANNEL LOSS AND BASE FLOW, Geological Survey, Denver, Colo. A. F. Moench, V. B. Sauer, and M. E. Jennings. Water Resources Research, Vol 10, No 5, p 963-968, October 1974. 8 fig, 1 tab, 17 ref.

Descriptors: *Routing, *Base flow, *Water loss, *Hydrograph analysis, Computer programs, Mathematical models, *Oklahoma, Surfacegroundwater relationships, Open channel flow, Stage-discharge relations.
Identifiers: *North Canadian River(Okla).

The convolution integral was used to compute continuous variations in channel loss and base flow that result from a reservoir release on the North Canadian River in central Oklahoma. The open channel flow hydrograph was routed by using the unit response method and then modified for interaction with the aquifer. Stream losses and gains were evaluated from the arbitrary fluctua-tions in stream stage by using average values of aquifer parameters. In spite of gross simplification pertaining to the nature of the groundwater system, good agreement with the actual flow hydrograph was obtained. (Knapp-USGS) W75-00631

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CON-STRAINTS - PHASE I, Nevada Univ., Reno. Center for Water Resources Research. For primary bibliographic entry see Field 5G. W75-00701

A COMPARISON OF OVERLAND FLOW MODELS. Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-00704

DISTRIBUTION PATTERNS OF MUDFLAT VEGETATION IN IOWA FLOOD CONTROL RESERVOIRS Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 2I.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4 Control Of Water On The Surface—Group 4A

W75-00705

THE EFFECT OF SURFACE DRAINAGE ON WATER TABLE RESPONSE TO RAINFALL.
North Carolina State Univ., Raleigh. Dept. of
Biological and Agricultural Engineering; and
North Carolina State Univ., Raleigh. Dept. of Soil For primary bibliographic entry see Field 2A. W75-00786

STREAMFLOW REGULATION WITH PUMPED

STORAGE RESERVOIRS,
Ohio Agricultural Research and Development
Center, Wooster. B. H. Nolte, and G. O. Schwab.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 440-442, May-June 1974. 3 fig, 3 tab, 2 ref.

Descriptors: *Regulated flow, *Flow duration, *Pumped storage, Flow augmentation, Model stu-dies, Reservoirs, Detention reservoirs, Streamflow, Natural flow, Flow rates, Reservoir releases, Flow control, Streams, Reservoir storage, Water supply.

The application of a simulation model of pumped storage reservoir regulation to obtain regulated flow-duration curves for streamflow regulation was described. The model was applied to 26 years of mean daily streamflow records by using several pumping rates, reservoir capacities, and reservoir release rates. The regulated streamflow was determined by the operating rules of the pumped storage streamflow regulation system and the capacity of the various system components. In general, regulation can decrease the rate and duration of high flows, increase the rate and duration of low flows, and decrease the monthly variation in low flows. For example, a 1.3 cu ft/sec/sq mile (csm) flow below a regulation system has the same frequency of occurrence as a 10 csm natural flow. No attempt was made to determine the economic feasibility of pumped storage streamflow regula-tion. (Humphreys-ISWS) W75-00796

THE MAP ABSTRACT OF WATER RESOURCES: ALABAMA, Geological Survey, University, Ala. For primary bibliographic entry see Field 7C. W75-00797

LOW-FLOW CHARACTERISTICS STREAMS IN THE WILLAPA DRAINAGES, WASHINGTON, OF BAY Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2E.

COMPUTATION OF THE STRENGTH OF THE MELTING ICE COVER OF RIVERS AND RESERVOIRS AND FORECASTING OF THE TIME OF ITS EROSION,
Hydrometeorological Service of the USSR, Moscow. For primary ary bibliographic entry see Field 2C.

RUNOFF FORECASTS-SNOWMELT THEORETICAL PROBLEMS, Hydrometeorological Service of the USSR, Moscow.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 829-839, 1973. 6

Descriptors: *Snowmelt, *Runoff forecasting, Streamflow forecasting, Water Hydrologic budget, Infiltration, Evaporation, Runoff. Water vield.

Theoretical concepts of snowmelt runoff formation, the principles and possibilities for long-range floodflow forecasting, and the prospects of further development are reviewed. The volume of snow melt runoff in any basin depends on three main factors: (1) water equivalent of snow cover, (2) water absorbed by the river basin, and (3) evaporation of meltwater during the flood period. The amount of water absorbed in a given year by a basin can be determined only from the water balance equation. Factors that define water ab-sorption by river basins include both relatively constant physical characteristics of basins, such as topography, soils, vegetation, and some others, and variable factors, such as soil moisture content, temperature, and depth of freezing. These factors depend, in their turn, on the antecedent meteorological conditions. These factors ultimately define the variations in the water absorption of river basins from year to year. (See also W75-00809) (Knapp-USGS)

TECHNIQUES FOR PREDICTING SNOW COVER RUNOFF,
National Weather Service, Silver Spring, Md.

E. Anderson.

Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 840-863, 1973. 8 fig, 53 ref. In: The Role of Snow and Ice in Hydrology;

Descriptors: *Snowmelt, *Runoff forecasting, *Streamflow forecasting, *Simulation analysis, Statistical methods, Mathematical models, Water yield, Water balance, Hydrologic budget, Statistical models.

The dominant variables in snow hydrology that affect river forecasts are discussed in terms of areal variability as related to geographical factors. The two basic types of forecasts, short-term and seasonal yield forecasts, are discussed. The use of simulation models to isolate and evaluate relation-ships between variables and the use of more advanced statistical methods to define probabilities seem likely to result in more reliable forecasts. Im-proved simulation models offer a great potential as both a forecasting tool and as a means to improve understanding of the snow process. (See also W75-00809) (Knapp-USGS) W75-00873

BASIN-WIDE WATER EQUIVALENT ESTIMATION FROM SNOWPACK DEPTH MEASURE-

Ontario Ministry of the Environment, Toronto.
Water Quantity Management Branch.

L.A. Logan.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 864-884, 1973. 3 fig. 5 tab. 11 ref.

Descriptors: *Water equivalent, *Water yield, *Snowpacks, *Snowmelt, Water balance, Runoff forecasting, Sampling, Snow surveys, Data collections, Hydrologic data, Variability, Regression analysis, Statistical methods.

Data on snowpack were compiled for 4 years of snow observations in an IHD representative drainage basin. Statistical analysis, based on the sampling theory for normal distribution, was applied to the observations to determine the sampling errors and areal variability of the snowpack parameters. Climatic criteria differentiate between a snow accumulation and a snowmelt period. Based on sampling in specified elevation zones and for each period, sets of regression equations relate snowpack density to logarithm-transformed snowpack depth. These empirical equations predict snowpack density and estimate water equivalent from snowpack depth measurements. The variance explained by each regression improves with the inclusion of the effect of meteorological factors. The snow survey data for the 1971-72 snow season and data selected from regional snow courses are used to demonstrate the applicability of the empirical equations. With the use of these empirical equations it is possible to improve the accuracy of the estimates of the basin water equivalent by increasing only the number of snowpack depth measurements. (See also W75-00809) (Knapp-USGS)

FORECASTING RUNOFF; OPERATIONAL PRACTICES, British Columbia Univ. (Vancouver).

M. C. Ouick.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 943-955, 1973.

Descriptors: *Streamflow forecasting, *Reviews, *Runoff forecasting, *Snowmelt, Statistics, Mathematical models, Water balance, Water yield.

Forecasting runoff which arises predominately from snowmelt is reviewed. The methods used for making short-term and long-term forecasts by various agencies in different parts of the world are discussed. Examples are given of statistical forecast equations, channel routing methods, and the more complex computer techniques of hydrological modeling. Although there are many similarities in forecast technique variations in river basin characteristics give rise to changes in emphasis of forecast and changes in significance of forecast parameters. Some consideration is given to data acquisition and to the problems of accurate data measurement which is the basis of all forecasting. The organization of forecasting in various parts of the world and the responsibilities of various agencies are reviewed. (See also W75-00809) (Knapp-USGS) W75-00879

SOME APPROACHES TO SNOWMELT PRE-

DICTION, Utah State Univ., Logan.

J. P. Riley, E. K. Israelsen, and K. O. Eggleston. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 956-971, 1973.

Descriptors: *Snowmelt, *Mathematical models, *Water balance, Hybrid computers, Water yield, Runoff forecasting, Streamflow forecasting.

Operational submodels of the snowmelt process were studied for inclusion in general hydrologic models. The main emphasis in the development of the three submodels was that the required data be only those which are usually available on an instrumented watershed. The submodels were programmed on a hybrid computer and tested using data from prototype watersheds. The basis of each model is a fundamental and logical mathematical representation of the various phenomena involved in terms of the time and space increments adopted for the model. (See also W75-00809) (Knapp-USGS) W75-00880

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

MATHEMATICAL MODEL OF SPRING FLOOD FORMATION AND POSSIBILITIES OF ITS USE FOR SHORT-RANGE FORECASTING, Hydrometeorological Service of the USSR,

Moscow. V. A. Belchikov, and V. I. Koren.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 972-980, 1973. 1 fig. 6 ref.

Descriptors: *Snowmelt, *Flood forecasting, *Mathematical models, Runoff forecasting, Streamflow forecasting, Water yield, Infiltration, Water balance.

A model describing snowmelt, water yield, infiltration, surface retention, and water flow down slopes and river beds was obtained by using physical laws and empirical rules. Using the model for short-range forecasting is discussed. The model was tested for the medium-size (up to 6000 sq km) watersheds of the European area of the USSR When choosing the general model, the process of formation of spring flood hydrograph was divided into two parts: (1) formation of water supply to a watershed surface, and (2) its transformation into a runoff hydrograph. The model was built so that the parameters for each of these parts were defined independently. (See also W75-00809) (Knapp-USGS) W75-00881

APPLICATION OF A PARAMETRIC MODEL FOR ESTIMATING SNOW ACCUMULATION AND FLOW FORECASTING, Waterloo Univ. (Ontario). For primary bibliographic entry see Field 2C. W75-00882

MODELLING SNOWMELT RUNOFF IN AN ARCTIC COASTAL BASIN, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 2A.

DAILY AND SEASONAL RUNOFF FORECAST-ING WITH A WATER BUDGET MODEL, British Columbia Univ., Vancouver. Dept. of Civil Engineering. M. C. Quick, and A. Pipes.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1017-1034, 1973.

Descriptors: *Runoff forecasting, *Water balance, *Snowmelt, Hydrologic budget, Weather data, Meteorological data, Mountains, Mathematical models, Soil moisture, Evaporation, Snowpacks,

A computer model was designed for forecasting daily values and seasonal volumes of streamflow which arise from snowmelt and rain. The model carries out a total water budget and identifies the contributions to runoff, soil moisture, and evaporation by area-elevation bands in the mountainous catchment. The model coefficients are held constant both throughout the season and from year to year. Short-term forecasts are made from preceding meteorological data and weather forecasts. Long-term forecasts of seasonal volume inflows are made by using snowpack measure-ments and antecedent conditions together with recorded weather patterns from previous years. Weather patterns are selected which can be classified as average, extreme-high, and extreme-low, so that the most probable volume together with upper and lower bounds can be forecast. (See also W75-00809) (Knapp-USGS) W75-00885

NEW TECHNIQUES IN FORECASTING RU-NOFF FROM SNOW,

Army Englineer District, Portland, Oreg.
D. M. Rockwood.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1058-1061, 1973.

Descriptors: *Runoff forecasting, *Columbia River, *Reviews, *Snowmelt, Streamflow forecasting, Model studies, Mathematical models,

Design of hydrologic models to be used in forecasting basin response as developed from ex-perience in Columbia River Basin applications is reviewed. Hydrologic simulation models were developed on the basis of attaining a proper balance between theory and practice, in order to achieve hydrologically sound yet operationally practical solutions in modeling technique. The commentary and conclusions are based on 15 years of experience in application of digital computer models to streamflow forecasting and reservoir regulation on a real-time operational basis. (See also W75-00809) (Knapp-USGS) W75-00888

COMPUTER SIMULATION TECHNIQUES FOR FORECASTING SNOWMELT RUNOFF, Hydrocomp, Inc., Palo Alto, Calif.

N. H. Crawford.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1062-1072, 1973. 5 fig, 2 tab, 7 ref.

Descriptors: *Simulation analysis, *Reviews, *Snowmelt, *Runoff forecasting, Streamflow forecasting, Mathematical models, Reviews.

Simulation methods for hydrologic process including snow accumulation and melt are reviewed. The general availability of digital computers and remote terminals permit the application of simulation to forecasting in almost all watersheds. Basic mathematical model development is described. Meteorologic and hydrologic data and the necessary components of computer programming that could be used for forecasting are reviewed. The role of simulation in water resource system management is discussed. (See also W75-00809) (Knapp-USGS) W75-00889

SNOWMELT RUNOFF INVESTIGATIONS FOR DEVELOPING FORECAST METHODS, Hydrometeorological Service of the USSR, Moscow.

V. D. Komarov.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1083-1088, 1973.

Descriptors: *Snowmelt, *Runoff forecasting, *Streamflow forecasting, *Routing, Data collections, River forecasting, Flood forecasting. Identifiers: *USSR.

Short-range forecast methods for river runoff in the USSR use snowmelt intensity and long-range water supply forecasts for the whole flood period. Seasonal forecasts of snowmelt runoff for lowland and mountain rivers which constitutes an average 60-68 percent of the annual runoff have been prepared by the Hydrometeorological Service of the USSR on a routine basis for about 50 years. The basis for the short-range flood discharge forecast, exclusive of large rivers, is routing. To increase the accuracy of routing it is necessary to intensify theoretical and experimental investigations of flood formation processes and to improve the technique of those basin observations that provide the initial data. The problems of those investigations and their possible solutions are briefly discussed. (See also W75-0809) (Knapp-USGS) W75-00891

FORECASTING RUNOFF FROM UNIVERSAL SURFACE GAUGE SNOWMELT MEASURE.

Agricultural Research Service, Boise, Idaho. Soil and Water Conservation Research Div. L. M. Cox, and J. F. Zuzel.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1089-1097, 1973.

Descriptors: *Runoff forecasting, *Snowmelt, *Instrumentation, Data collections, Hydrologic data, Precipitation gages, Streamflow forecasting.

Daily snowmelt can be used to forecast runoff for a basin during peak snowmelt events. The method of least squares, coupled with an accumulation procedure, demonstrated a high correlation between accumulated runoff from a watershed and accumulated snowmelt one day earlier at the index plot. High correlations were obtained for daily runoff values and collected snowmelt for several snowmelt events occurring on basins ranging in size from 0.4 to 1335 sq km. (See also W75-00809) (Knapp-USGS) W75-00892

THE SIGNIFICANCE OF SNOW IN BRITAIN, Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C. W75-00893

FOR DUNCER FORECASTS HIGHLY GLACIERIZED BASINS, Norwegian Water Resources and Electricity Board, Oslo. Glaciology Section. For primary bibliographic entry see Field 2A. W75-00894

REGIME OF A SURGING GLACIER BETWEEN ADVANCES, Akademiya Nauk SSSR, Moscow. Institut Geografii. For primary bibliographic entry see Field 2C. W75-00897

MEASUREMENT AND FORECASTING SPECIFIC TO RIVER AND LAKE ICE, Hydrometeorological Research Service of the USSR, Moscow. For primary bibliographic entry see Field 2C. W75-00900

ATMOSPHERIC CIRCULATION FORECASTING OF DATES OF ICE FORMA-TION IN RIVERS, Hydrometeorological Service of the USSR, Moscow. For primary bibliographic entry see Field 2C. W75-00901

METHOD OF FORECASTING DATE OF BREAKUP OF RIVER ICE, Minami-Kyushu Univ., Takanabe (Japan). For primary bibliographic entry see Field 2C.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

SHORT-RANGE FORECASTING OF FLOATING ICE IN RIVERS, LAKES, AND RESER-VOIRS,

Hydrometeorological Service of the USSR,

For primary bibliographic entry see Field 2C. W75-00906

DURATION OF ICE PHENOMENA AND POSSI-BILITIES OF ITS FORECASTING (FOR THE

Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR).
For primary bibliographic entry see Field 2C.
W75-00907

CHANGES IN ICE CONDITIONS IN REGU-LATED RIVER BASINS. Norwegian Water Resources and Electricity

Board, Oslo. For primary bibliographic entry see Field 2C.

W75-00909

MODIFICATION OF ICE COVERS AND SUB-SEQUENT RUNOFF BY MAN-MADE STRUC-TURES,

Hydro-Electric Power Commission of Ontario,

D. M. Foulds.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1436-1441, 1973.

Descriptors: *Ice cover, *Rivers, *Canada, *Dams, Reservoirs, Hydroelectric power, Runoff,

The influence of dams, ice booms, and hydroelectric power generation on ice cover formation and control of ice movement is discussed using case histories from three rivers in Canada. The heat produced by cities influences ice production. Manmade structures in the water have accelerated the rate of formation of ice covers, improved the ability of rivers to transport water under the ice cover, restricted ice movements into critical areas, and greatly reduced the severity and frequency of jams. (See also W75-00809) (Knapp-USGS) W75-00923

ICE FORMATION IN LAKE ERIE AND THE NIAGARA RIVER, ITS EFFECTS AND CON-TROL, Water Survey of Canada, Guelph (Ontario).

B. E. Russell.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1442-1462, 1973. 10 fig, 3 ref.

Descriptors: "Ice, "Lake ice, "Iced lakes, "Hydroelectric power, "Lake Erie, Rivers, Ice breakup, Ice jams, "Canada. Identifiers: "Niagara River.

Power operations on the Niagara River are adver-sely affected by ice floes and jams in the river. In 1964 the Power Entities in Canada and the United States, under authorization and supervision of the International Joint Commission, installed an ice boom across the head of the Niagara River in Lake Erie. The purpose of the ice boom is to trap minor runs of floating ice and hold them in place until consolidated, thus encouraging the rapid and early formation of ice arch. The boom is not designed to rormation of ice arch. The boom is not designed to restrain massive ice runs or pressures. The same restraint is applied following disruption by storms and in the breakup period in the spring. The ice boom has been most satisfactory; utilization of water for power production has increased in the order of 20% and only one formal complaint has been received from interests along the river. (See also W75-00809) (Knapp-USGS) W75-00924

IMPACT OF SNOWPACK MANAGEMENT ON SNOW AND ICE HYDROLOGY, Bureau of Reclamation, Denver, Colo. Engineer-

ing and Research Center. For primary bibliographic entry see Field 3B. W75-00925

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 8A. W75-00929

KNIFE LAKE IMPROVEMENT RC AND D MEASURE ONANEGOZIE RC AND D PRO-JECT, KANABEC COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATE-MENT),

MEN1), Soil Conservation Service, Washington, D.C. Available from National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va. 22161, as EIS-MN-73-0903-F, \$7.50 in paper copy, \$2.25 in microfiche. April 1973. 108 p, 10 tab, 3 map.

Descriptors: *Environmental effects, *Minnesota *Dam construction, *Soil convervation, *Federal government, Water management(Applied), government, Water management(Applied), Watershed management, Land management conservation, Land use, Administrative agencies, Erosion control, Engineering structures, Dams, Multiple-purpose projects, Flood control, Flood protection, Impoundments, Reservoirs, Multiple-purpose reservoirs, Lakes, Recreation facilities, Water resources development, Flooding, Governmental interrelations, Bank erosion.
Identifiers: *Environmental Impact Statements,
*Knife River(Minn), Dam effects.

This project involves the application of conservation land treatment measures to 3570 acres of the Knife River Watershed in central Minnesota, and conctruction of a multiple-purpose dam on the Knife River. The dam will be located one mile below the site of the original dam which was washed out in 1972, and the project will include facilities for recreation as well as flood control. The project will improve and enhance the land treated, will reduce phosphorous contribution from livestock feedlots around Knife Lake, and will reduce erosion and pool fluctuation around the perimeter of the lake. 132 acres of agricultural land will be inundated and added to Knife Lake and 54 acres will be converted to recreational use.

One mile of stream habitat will be converted to lake habitat. Limited erosion will occur during construction. Alternatives considered were the utilization of the old dam site, reliance upon the existing temporary dam, removal of the temporary dam, construction of a single purpose dam, and no action. The proposed project is compatible with the present and future long-term use of the area's natural resources and faces no significant opposition. (Deckert-Florida) W75-00930

WATER MANAGEMENT THROUGH IRRIGA-TION AND DRAINAGE: PROGRESS, PROBLEMS, AND OPPORTUNITIES.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR2, p 153-178, June, 1974. 28 ref.

Descriptors: *Water management, *Irrigation, *Drainage, *Water supply, Water conservation, Seepage, Evaporation, Artificial recharge, Waste disposal, Water utilization, Efficiencies, Water quality, Erosion, Sedimentation, Nutrients, Animal wastes, Salts, Landfills, Reviews.

A wide range of problems associated with drainage and irrigation of water are discussed. Water supply conservation and management involves seepage and evaporation from water surfaces; various methods of recharge; quality and pollution; social, economics, and institutional aspects; and improving structures. Also discussed are water use efficiency, with emphasis on various irrigation systems; and water quality improvement in the areas of erosion, nutrients, animal wastes, salts, and land disposal of wastes. (Sandoski-FIRL)

A REFINED COMPUTATIONAL ALGORITHM FOR A CLASS OF DYNAMIC PROGRAMMING PROBLEMS WITH APPLICATIONS TO THE

SNAKE-COLUMBIA RIVER BASIN, Washington State Univ., Pullman. Dept of Computer Science. R. D. Dutton.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-237 166, \$7.00 in paper copy, \$2.25 in microfiche. Doc-toral Thesis, 1973. 174 p, 4 fig. 40 tab, 54 ref, 3 ap-pend. OWRT A-049-WASH(2).

Descriptors: Economics, *Dynamic programming, Descriptors: Economics, "Dynamic programming, Reservoirs, "Management, "Diversion, Op-timization, Planning, Dams, Water storage, Com-puter programs, Pollution abatement, Streams, River basins, Flow, Pacific Northwest, Washing-ton, Discretization, Evaluation, Constraints, Systems, analysis, Mathematical models Systems analysis, Mathematical models, *Columbia River.
Identifiers: *Economic loss, *Snake River, Power

Economic loss to the Pacific Northwest due to a diversion of the Snake and Lower Columbia River waters is determined. The total optimal value of the system, with and without diversion, and the optimal reservoir management policies are derived using dynamic programming. The planning horizon is one year and the stages in the dynamic program represent one month time intervals. The states for each stage consist of all possible combinations of discrete storage volumes of the seven dams in-cluded in the model. A discretization has been used which leads to 50,544 different states per stage. The return function of this system is shown to be of a type of generalized objective function which generates unimodal recursive functions in a dynamic programming formulation. The ex-haustive search used in each step of the dynamic program can then be replaced by a Fibonacci search. The optimal values and policies are given for a variety of diversions. The model is able to adjust the flow by proper reservoir management so that the full capability of the streams to abate pol-lution is retained. The theoretical results are capa-ble of application to problems and data substan-tially more complex than the data that was availa-ble for this specific problem. (Bell-Cornell)

SURFACE RUNOFF SIMULATION MODEL, Nebraska Univ., Lincoln. Dept. of Civil Engineer-For primary bibliographic entry see Field 2A. W75-00969

REGIONAL ANALYSIS FOR DEVELOPMENT PLANNING IN DISASTER AREAS, Cornell Univ., Ithaca, N.Y. Center for Urban Development Research. For primary bibliographic entry see Field 6G. W75-00970

A MODEL FOR SIMULATING RIVER AND RESERVOIR TEMPERATURES WITH APPLICATIONS FOR ANADROMOUS FISH CATIONS FOR ANADROMOUS FISH MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 5C.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

W75-00978

FLOOD PLAIN INFORMATION: FOX RIVER LAKE WINNEBAGO, CITY OF OSHKOSH, WINNEBAGO COUNTY, WISCONSIN. Army Engineer District, Chicago, Ill. Prepared for the East Central Wisconsin Regional

Planning Commission, July 1973. 31 p, 17 fig, 8

Descriptors: *Floods, *Flooding, *Flood plain, *Flood plain zoning, *Flood control, Flood protec-

Titon Danie Voining, 1 to No. Project Flood.

Oshkosh, on the western shore of Lake Winnebago, is comprised of residential, commercial and industrial areas which can be inundated by flood waters of the Fox River which flows into Lake Winnebago. The portion of the river studied is 3.71 miles long, while the flat, partially marshy lakeshore is 13.9 miles. Floodplain developments along the lake north of Oshkosh are institutional and residential. Gaging stations, records, a teleme-tering gage, newspaper files, historical documents and records provided information. Floods which rise slowly and stay out of banks for a long time occur in all seasons with more extensive floods in the spring resulting from rainfall and/or snowmelt. Wind action causing wind set-up and wave action results in flooding and soil erosion. Two dams built in the mid-1800's have some control over water discharge. The city of Oshkosh as well as Winnebago County (though not yet approved) have adopted flood plain zoning provisions. The highest known flood on November 8, 1881 crested at 749.5 feet, mean sea level datum (msld), prior to the sluicing capacities of the dams. The most recent flood occurred on March 25, 1973 cresting at 747.95 feet msld. Property damage was severe. An Inter-mediate Regional Flood (IRF) caused by a combination of rainfall and runoff would crest at 752 feet msld while a Standard Project Flood would be 3 feet higher. Both type floods would result in in-undation of residential, commercial, industrial and institutional sections of Oshkosh. This report furnishes a basis for the adoption of land use controls to guide flood plain development. (Salzman-North Carolina) W75_00989

FLOOD PLAIN INFORMATION, CLEAR FORK AND ELK CREEK, JELLICO, TENNESSEE. Army Engineer District, Nashville, Tenn Prepared for the City of Jellico, Tennessee. March, 1972. 31 p, 9 fig, 6 tab, 9 plates.

Descriptors: *Flooding, *Floodplains, *Flood con-*Flood protection, Flood damage, Historic floods. *Tennessee. Identifiers: Jellico(Tenn), Clear Fork River(Tenn),

Elk Creek(Tenn).

Due to scarcity of suitable, flat land, much of the industrial, residential, and commercial development of Jellico in Campbell County, adjacent to Kentucky-Tennessee state line, approximately 25 miles north of Knoxville, lies on the floodplain. The channel gradient for Clear Fork River, and its tributary, Elk Creek, is unusually flat averaging about 3 feet per mile and 5 feet per mile respec-. The river is about 100 feet in width with well defined, treelined banks about 15 feet high. Elk Creek is half as wide with banks varying from to 10 feet in height. Interviews, newspapers, and historical documents provided data. Most floods occur in winter or early spring resulting from from tal-type storms. Flooding on Elk Creek is often due to backwater from Clear Fork. Natural as well as manmade obstruction, including a Strip Mining Reclamation Project impede flood flow. A minor amount of channel improvement was accom-plished on Elk Creek. Jellico participates in the

federal flood insurance program and has enacted land use regulations to reduce exposure to future floods. The highest known flood occurred on March 23, 1929. The most recent flood, January 7, 1970, caused by heavy rains plus five-inch snow melt, resulted in extensive property damages. An Intermediate Regional Flood (IRF) would surpass any known flood by one-half foot. A Standard Pro-ject Flood (SPF) would be rare, 14 to 16 feet higher than the 1929 flood. Both would be destructive and hazardous. The report provides the basis for further study and planning in arriving at solu-tions to minimize vulnerability to floods. (Salzman-North Carolina) W75-00990

FLOOD PLAIN INFORMATION, MILL CREEK, SEVEN MILE CREEK, NASHVILLE, TENNES-

Army Engineer District, Nashville, Tenn. Prepared for the City of Nashville, Tennessee. January, 1973. 22 p, 7 fig, 3 tab, 13 plates.

Descriptors: *Flooding, *Flood plain, *Flood damage, *Tennessee, Historic floods, Peak discharge.

Identifiers: *Nashville(Tenn), Mill Creek(Tenn), Seven Mile Creek(Tenn).

Mill Creek, a tributary of Cumberland River, drains a 108 square mile area lying south and east of Nashville. It slopes at about 10 feet per mile and has well-defined banks 10 to 15 feet above streambed which support an abundant growth of streambed which support an abundant growth of trees and brush. Seven Mile Creek, the largest tributary of Mill Creek, is considerably steeper, averaging about 35 feet per mile for the entire stream. Channel widths range from 50 feet on Seven Mile Creek to 100 feet on Mill Creek, and floodplain widths are 300 feet and 700 feet, respectively. Recent urbanization pressures have in-creased the development of the floodplain of Mill Creek. Although much of Seven Mile Creek's floodplain remains agricultural, extensive re-sidential development is imminent. A stream gage, operating since 1953, newspapers, historical writings, and interviews provide data. Floods occur during all seasons, but are more prevalent in winter and early spring resulting from heavy precipitation, with flooding lasting 8 to 12 hours. The highest flood occurred on March 21, 1955 cresting at 19.73 feet causing severe property damage. The latest flood on February 27, 1972, crested at 18.38 feet. An Intermediate Regional Flood would surpass any known flood. Rarity and severity characterize a Standard Project Flood in this area. This report serves as a tool to guide fu-ture land use. (Salzman-North Carolina) W75-00991

FLOOD PLAIN INFORMATION, CUMBER-LAND RIVER, POOR, CLOVER AND MARTINS FORKS, AND CATRON CREEK, HARLAN, KENTUCKY.

Army Engineer District, Nashville, Tenn. Prepared for the City of Harlan, Kentucky, August, 1969. 57 p., 14 fig. 8 tab, 16 plates.

*Flooding. *Flood Descriptors: control. Floodplain zoning, Flood protection, Historic floods, Reservoirs, *Kentucky. Identifiers: Cumberland River(Ky), Poor Fork(Ky), Clover Fork(Ky), Martins Fork(Ky), Catron Creek(Ky), Harlan(Ky).

Located in mountainous southeastern Kentucky, Harlan is prone to flooding by five streams. Principal developments are on high ground, but there are several commercial, industrial and residential developments which are vulnerable to flooding. Sewage and water treatment plants are adversely affected by floods. Data of stream stages and discharges, dating back to 1940, as well as interviews, newspaper files, and historical records pro-vide information. Floods occur during winter and early spring, lasting about 12 hours on the river

and shorter times on the smaller streams. Cranks Creek Reservoir, upstream from Harlan, functions as a detention reservoir and will have some effect on flood height at Harlan, though not eliminating on flood height at Harian, though not eliminating serious flood hazards. A second reservoir on Martins Fork is proposed. Floodplain laws, enacted by the state of Kentucky retard development of floodways and floodplains. Rising waters have plagued the settlers for many years with severe flooding reported in 1890. The greatest flood, on March 12, 1963, crested on the Cumberland River at elevation 1, 165 feet. Most recent flood occurred a compared 1, 1967 when the Cumberland rested 4 on March 7, 1967 when the Cumberland crested 4 feet below the maximum recorded stage. Damage from both floods was devastating. An Inter-mediate Regional Flood (IRF) would be 2 to 3 feet higher than the largest known flood. A Standard Project Flood (SPF) may exceed the 1963 flood by as much as 18 feet. Future flooded areas, flood profiles and elevations of overflow for IRF and SPF are shown by photographs and plates. The re-port provides basis for further study and planning in arriving at solutions to minimize vulnerability to flood damages. (Salzman-North Carolina)

FLOOD PLAIN INFORMATION, CUMBER-LAND RIVER, RICHLAND AND FIGHTING CREEKS, BARBOURVILLE, KENTUCKY. Army Engineer District, Nashville, Tenn. Prepared for the city of Barbourville, Kentucky,

Descriptors: *Flooding, *Flood damage, *Levees, *Flood protection, Floodplains, Historic floods,

April, 1974. 36 p, 11 fig, 1 tab, 14 plates.

Kentucky. Barbourville(Ky), Cumberland Identifiers: Richland Creek(Ky), Fighting Creek(Ky)

Barbourville, at the confluence of Richland Creek and the Cumberland River, is about 40 miles northwest of historic Cumberland Gap. Backwater flooding from Cumberland River along Richland and Fighting Creeks is discussed. Six miles of the river slope at an average of 1.5 feet per mile with a channel 225 feet wide, 25 feet deep and an average floodplain of 1600 feet. A levee extends .8 mile along the right bank. Extensive industrial and commercial development including the central business district lies within the flood reach, with most of the Fighting Creek overflow area being used for agriculture. U.S. Geological Survey has recorded stream gages since 1922. Additional gage recordings, newspaper accounts and scattered high water markers provided information since 1882. Floods generally occur in winter and early spring with a duration of three or four days. Barbourville has recently been approved for participa-tion in the National Flood Insurance Program which will require adoption of floodplain zoning. The greatest flood occurred on January 8, 1946 with a crest of 42.8 feet creating widespread destruction. The most recent flooding of the river was November 22, 1973, incurring damages estimated at \$1 million. An Intermediate Regional Flood (IRF) would crest at 44.0 feet which is one foot below the levee. A Standard Project Flood (SPR) would crest at 54.1 feet, 11 feet above the record flood of January, 1946, overtopping the levee surrounding Barbourville by about 8 feet. Its effect would be severe, resulting in loss of lives as well as health hazards. The report provides infor-mation for land use planning and for making deci-sions concerning floodplain utilization. (Salzman-North Carolina) W75-00993

FLOOD PLAIN INFORMATION, LITTLE BUSHKILL CREEK, AND SHOENECK CREEK, NORTHAMPTON COUNTY, PENNSYLVANIA. Army Engineer District, Philadelphia, Pa. Prepared for the Lehigh-Northampton County Joint Planning Commission, Northampton County, Pennsylvania, April 1973. 23 p, 8 fig, 8 tab, 15 plates.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4 Control Of Water On The Surface—Group 4A

Descriptors: *Flooding, *Floodplains, *Flood pro-*Flood control, Historic floods, tection. Pennsylvania.

Identifiers: *Little Bushkill Creek(Pa), *Shoeneck Creek(Pa), Northampton County(Pa), Plainfield Township(Pa), Palmer Township(Pa).

Portions of Northampton County which is mainly undeveloped, including residential and commer-cial properties are subject to flooding from either creek, Little Bushkill Creek or Shoeneck Creek. Historical documents, newspapers, flood records and interviews provide data since there are no gaging stations located on the creeks. Floods occur during all seasons, particularly the spring, from heavy rains and snowmelt. Both creeks are susceptible to flash floods from thunderstorms and hurricane activity. Natural and manmade ob-structions including 39 bridges and 10 culverts restrict flood flows. Two dams located on the creeks have no flood control capacities. Several treess have no flood control capacities. Several townships have enacted flood plain zoning or-dinances. The largest flood occurred on July 9, 1945 sweeping away homes and bridges. The latest flood, on August 18-19, 1955, caused by torrential rains, created by Hurricane Diane, again damaged residential and commercial areas. An Intermediate Regional Flood (IRF) or Standard Project Flood (SPF) would result in inundation of residential, commercial and agricultural areas more severe than past floods. Index maps and plates detail potential overflow areas. This report furnishes a basis for the adoption of land use controls to guide development. (Salzman-North Carolina) W75-00994

FLOOD PLAIN INFORMATION, CRUM CREEK, DELAWARE COUNTY, PENNSYL-VANIA.

Army Engineer District, Philadelphia, Pa. Prepared for Delaware County Planning Commission, Delaware County, Pennsylvania. March, 1974. 22 p, 6 fig, 7 tab, 14 plates.

Descriptors: *Flooding, *Floodplains, *Flood protection, *Flood control, *Floodplain zoning, Flooddamage, Historic floods, *Pennsylvania.
Identifiers: *Crum Creek(Pa), Delaware Coun-

About one-half of Crum Creek's floodplain covers a portion of Delaware County. Flooding of this area causes damage to residential, commercial and industrial property. With a well-defined channel, the creek passes from a narrow floodplain covered with vegetation into a flatter land area where the channel and overbanks are covered with concrete as it meets the Delaware River. Upstream is located the Philadelphia Suburban Water Works and two large dams form reservoirs for water supply. Downstream, culverts encompass 1300 feet of the creek as it flows underneath an industrial complex. Twenty bridges are planned for construction as well as realignment of the channel. Field investigations and synthetic methods for deriving discharge data supplement the recordings of a stream gaging station. Flooding from heavy rainfall, run-off and hurricane activity occurs in all seasons. Delaware River can create a backwater effect which backs up flood water on Crum Creek. Only two of the five dams may retard peak flows from short duration storms. Neither dam would affect large infrequent floods. Although there are no flood control projects, floodplain zoning regula tions and ordinances are being adopted by flood-plain communities. The greatest known flood oc-curred on August 5, 1843 cresting at 105.7 feet. The most recent flood was September 13, 1971 after a rainfall of 12.3 inches. Property damage was severe and 4 fatalities were reported. An In-termediate Regional Flood (IRF) would damage the immediate floodplain while a Standard Project Flood would inundate areas adjacent to the flood-plain. Projected flood profiles are delineated on plates. (Salzman-North Carolina) W75-00995 FLOOD PLAIN INFORMATION: DENHALL RIVER, JUNEAU, ALASKA. INFORMATION: Army Engineer District, Anchorage, Alaska Prepared for the Greater Juneau Borough, April, 1971. 23 p, 7 fig, 3 tab, 12 plates.

Descriptors: *Flood forecasting, *Flood plains, *Flood damage, *Alaska, Flood profiles, Flood stages, Obstructions to flow, Land use. Identifiers: *Mendenhall River(Ak), *Juneau(Ak), Mendenhall Lake(Ak), Gastineau Channel(Ak), Flood plain management, Standard Project Flood, Intermediate Regional Flood.

Originating in Mendenhall Lake about ten miles west of Juneau, the Mendenhall flows generally southward for approximately 5 miles into Gastineau Channel, draining an area of about 103 square miles. A portion of the flood plain of a tributary, Montana Creek, that begins in the upper basin slopes is included in this study. Mendenhall River flood plains lie within a deep, narrow valley which now has limited development, but the land is prime for the development necessary to Juneau's expanding economy. A new pulp mill and a saw mill are already being built. Two bridges and sharp meanders create obstructions to floods. which generally occur from August to November with intense rainfall added to the basic flow from Mendenhall Glacier. Spring snow melt also causes high water. The greatest floods occurred in Sept. 1927 and 1943 resulting in no substantial damage since the area was largely undeveloped; the highest recorded flow rate was observed in Sept. 1967. There are no flood plain regulations in effect in Greater Juneau Borough and no flood damage prevention works in the study area. The general shape of the upper basin dictates that a flood would have a sharp rise due to extremely fast runoff with relative short duration. Using streamflow records and statistical analysis, projected maximum main channel velocity would reach 12 ft. per second in an Intermediate Regional Flood (IRF) and 18 ft. per second in a Standard Project Flood (SPF). Respective peak discharge would be 32,000 cfs and 57,000 cfs. Maps and cross sections Journal of the state of the sta Carolina) W75-00996

FLOOD PLAIN INFORMATION, POOR FORK, CLOVERLICK CREEK AND LOONEY CREEK,

CUMBERLAND, KENTUCKY.
Army Engineer District, Nashville, Tenn.
Prepared for the City of Cumberland, Kentucky.
August, 1972. 34 p, 11 fig, 5 tab, 10 plates.

Descriptors: *Flooding, *Floodplains, *Flood control, *Flood protection, *Kentucky, Flood frequency, Flood damage, Historic floods. Identifiers: *Cumberland(Kentucky), Poor Fork River(Ky), Creek(Ky). Cloverlick Creek(Ky),

Flooding from Poor Fork, Looney Creek and Cloverlick Creek inundated portions of the city of Cumberland, located in the mountains of southeast Kentucky and built in the flat, floodplain area. The channels are well defined, with steep gradients; their limits are defined by abrupt mountains rising from valley floor. Except for Cumberland, the floodplains are covered with trees and underbrush. Numerous residences and businesses have been built directly adjoining the stream bank. Information was obtained from a stream gage, newspaper files and interviews. Floods with a usual duration of 24 hours occur in winter or early spring as a result of frontal-type storms. Summer floods are rare and of short duration though the largest known flood occurred on August 8, 1898, cresting at 1428.2 feet. Severe flooding occurs almost yearly with the most recent flood on May 7, 1971 cresting at 1421.8 feet. On January, 1965, a channel improvement project by the Corps of Engineers was proposed and con-struction is pending. Minor channel clearing has been done. Gravel bars have been bulldozed to the banks to form small levees. Adoption of floodplain regulations is pending before the city council of Cumberland. An Intermediate Flood would crest at 1429.8 feet and a Standard Project Flood would average 5 feet higher, causing extensive damage. This report furnishes a basis for the adoption of land use control measures to guide floodplain development. (Salzman-North Carolina)

A METHODOLOGY FOR PLANNING LAND USE AND ENGINEERING ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT SYSTEM MANAGEMENT SYSTEM

Arizona Univ., Tucson.
For primary bibliographic entry see Field 6F.
W75-01002

OUTDOOR RECREATION AND WATER

RESOURCES PLANNING, Simon Fraser Univ., Burnaby (British Columbia). For primary bibliographic entry see Field 6D.

AND-USE PLANNING, Connecticut Univ., Storrs. Coll. of Agriculture and Natural Resources. For primary bibliographic entry see Field 6B. W75-01005

COASTAL STABILISATION AT BARTON-ON-For primary bibliographic entry see Field 6B. W75-01006

APPARATUS FOR CONVERTING THE ENER-GY OF OCEAN WAVES, Laitram Corp., New Orleans, La. For primary bibliographic entry see Field 7B. W75-01050

AN EVALUATION OF THE ADVISABILITY OF THE RELEASE OF THE GRASS CARP, CTENOPHARYNGODON IDELLA, INTO THE NATURAL WATERS OF THE UNITED STATES, Northern Illinois Univ., De Kalb. Dept. of Biological Sciences.

D. W. Greenfield. Trans Ill State Acad Sci. Vol 66, No 1/2, p 47-53.

1973. Identifiers: Age, *Carp(Grass), Ctenopharyn-godon-idella, Digestion, Feeding, Growth, Habits, Reproduction, Vegetation, *Reviews, *Aquatic weed control, Fish management.

A review of the literature concerning the biology of the grass carp, Ctenopharyngodon idella, is presented, including information on the usefulness of this species as an agent to control aquatic vegetation. Feeding habits, digestion, reproduction, age and growth, physiological requirements and interactions with other species are described. The advantages and disadvantages of the release of the grass carp are presented and recommendations concerning future control of this species are made.—Copyright 1974, Biological Abstracts, Inc. W75-01055

TYPES OF CONIFEROUS FORESTS OF THE WESTERN SLOPE OF THE CENTRAL URALS (ACCORDING TO FOREST MANAGEMENT DATA), (IN RUSSIAN), G. G. Kamenskii. Zap Sverdl Otd Vses Bot O-Va, 5, p 204-207, 1970.

Descriptors: *Soil types, *Forests, *Forest management, Conifers.
Identifiers: *USSR(Central Urals).

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

A brief description is given of 9 types of pine forests and 8 types of spruce forests, on the western slope of the Central Urals (USSR). Pine forests are represented by mountain pine forests (PF) (site classes IV-V) formed on steep slopes, of mainly southern exposure, Cladonia PF (IV-V)-on pinewood terraces, Vaccinium vitis-idaea-Cystisus PF (III)-on steep and moderately steep slopes, V. myrtillus PF (III)-on slopes of various steepness, Tilia PF (II)-on terraces and slopes, forb PF (III). Oxalis acetosella PF (II)-on gentle slopes, Polytrichum PF (IV)-in places of shallow occurrence of groundwaters, and Sphagnum PF (V)-along depressions with slight runoff. The types of soils are gravelly, sandy, sandy loams or slightly loamy. The predominant spruce forests are mountainous spruce forests SF (IV)-on steep and moderately steep slopes, Tilia SF (II)-on northeastern slopes, Oxalis acetosella SF (II)-on gentle slopes of hills, low ridges and leveled out sections, V. myrtillus SF (III)-on gentle and moderately steep slopes, forb SF (III)-on slopes and leveled out sections, riparian SF (III) or along river valleys and streams, Polytrichum SF (IV)-in places of shallow occurrence of groundwaters, and Carex-Sphagnum SF (V)-in swamped depressions. Soil are mainly loamy. Broad-leaved tree species usually predominate in the composition of regeneration on fellings.—Copyright 1974, Biological Abstracts, Inc.

AGE COMPOSITION OF POPULATIONS OF TUFTED HAIRGRASS (DESCHAMPSIA CAESPITOSA (L.) P.B.) ON FLOODPLAIN PASTURES OF THE NORTH DVINA AND OKA RIVERS, (IN RUSSIAN),

Moskovskii Gosudarstvennyi Pedagogicheskii Institut (USSR).

I. A. Zhukova

Biol Nauki, Vol 16, No 7, p 67-72, 1973, Illus.

Descriptors: *Grasslands, *Grazing, Pastures. Identifiers: Deschampsia caespitosa, *USSR(No. Dvina River), *USSR(Oka River).

Investigations established that regular grazing on floodplain meadows has a greater effect on the age composition of populations of tufted hairgrass than climatic factors. A constant grazing regume on the Oka and North Dvina floodplain meadows (USSR) can lead to the development of tufted hairgrass populations in time, their aging, and to transition of young normal populations to mature and then aging normal populations.--Copyright 1974, Biological Abstracts, Inc. W75-01080

THE PROTECTIVE FUNCTION OF FORESTS AND FUNCTIONAL MANAGEMENT OF THE FOREST SUBSTRATE, (IN FRENCH), Institutul de Studii st Profectari Forestiere, Bucharest (Rumania).

O. Carare, and R. Dissescu.

Bull Acad Sci Agric For, 1, p 171-179, 1972.

Descriptors: *Forest soils, *Forest management, Humidity, Microenvironment, Windbreaks.

The hydrological function and the anti-erosive function of forests are derived from the forest effect on atmospheric humidity, on isolation, on wind and on other natural factors as manifested by an increase in atmospheric humidity due to extended rain water retention and lower temperature of forest soil compared with bare soil, by reduction of solar radiation, and by reduction of wind velocity within and around the forest. In an afforested area the air is 2-2.5 times more ionized than in non-afforested terrain. Forests reduce the particulate level and that of other industrial pollu-tants.—Copyright 1974, Biological Abstracts, Inc. W75-01098

4B. Groundwater Management

HYDROGEOLOGY OF WETLANDS IN MAS-SACHUSETTS, Massachusetts Univ., Amherst. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2F.
W75-00553

LAND USE CONTROLS IN WATERSHED AND AQUIFER RECHARGE AREAS, R. G. Gerber.

Water and Sewage Works, Vol 121, No 4, p 122, 124-126, April 30, 1974.

Descriptors: *Land use, *Watersheds(Basins), *Water quality control, Runoff, Planning, Soil, Drainage, *Recharge, Water pollution control. Identifiers: *Aquifer recharge areas.

Regulations and planning for land use in aquifer recharge areas and watersheds are discussed. The need for control is evidenced by loss of water quality and quantity due to pollution and runoff. Economic and political aspects are mentioned. A recommended type of land use control plan is that of impact zoning, basing standards of land capa-bility on type and design of land use. Factors which determine such capability are soil, slope, drainage, and vegetation as well as social values. (Prague-FIRL) W75-00597

SELECTED WATER-LEVEL RECORDS FOR COLORADO, 1970-74,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 7C. W75-00619

WATER RESOURCES OF THE ST. LOUIS AREA, MISSOURI,
Missouri Geological Survey and Water Resources,

Rolla. D. E. Miller, L. F. Emmett, J. Skelton, H. G.

D. E. Miller, L. P. Emiller, J. Skelton, H. G. Jeffery, and J. H. Barks.
Water Resources Report 30, 1974. 114 p, 39 fig, 2 plate, 29 tab, 89 ref, 7 append.

Descriptors: *Water resources, *Missouri, *Streamflow, *Groundwater, Mississippi River, Missouri River, Alluvium, Aquifers, Surface waters, Floods, Water supply, Cities, Urban hydrology, Water quality, Water yield. Identifiers: St. Louis(Mo).

Water supplies in the St. Louis area, Missouri, are available from streams and from bedrock and alluvial aquifers. Of the 1200 million gallons of water used daily, about 82% is pumped from the Mississippi River and about 15% from the Missouri and Meramec Rivers. Approximately two-thirds of this pumpage is used for cooling in the generation of electric power. The aquifers account for 3% of the total pumpage. Only a small percentage of the water available in the alluvial aquifers of the area is being used. Areas having the greatest potential water available in the annual aquiters of the area is being used. Areas having the greatest potential for development of groundwater are in the Missisippi and Missouri River flood plains. Water from the alluvial deposits generally is a very hard calcium—magnesium—bicarbonate type with iron and um-magnesium-bicarbonate type with iron and manganese content commonly being high. Saline water has moved upward from the underlying bedrock into the alluvial aquifers in a few areas. This upward leakage may be a naturally occurring phenomenon, but part of it probably is through boreholes. The median 7-day low flows of small unregulated tributary streams generally range from 0 to 0.005 cfs per square mile in the northern two-thirds of the area and from 0.02 to 0.05 cfs per square mile elsewhere. The principal factors limiting future development are lack of sustained low flows and poor quality of the water in urbanized areas. Floods can occur during all months, but are most common in the March through July period.

Peak flows are increased by urbanization. Quality of surface water varies from good in the tributary streams of southern Jefferson County to very poor in the highly urbanized areas. (Knapp-USGS() W75-00621

GROUND-WATER LEVELS IN NEW MEXICO, 1970, AND CHANGES IN WATER LEVELS, 1966-70,

Geological Survey, Albuquerque, N. Mex. J. D. Hudson, R. L. Borton, and C. F. Sorensen. New Mexico State Engineer Office, Santa Fe, Technical Report 39, 1974. 123 p, 53 fig, 41 tab, 27

Descriptors: *Groundwater, *New Mexico, *Irrigation water, *Basic data collections, Hydrologic data, Data collections, Water utiliza-

Water-level measurements made in about 1,500 water-level measurements made in about 1,000 wells in New Mexico, primarily in areas where groundwater is used in quantity for irrigation, municipal, and industrial purposes, are tabulated. Changes in water level, irrigated acreage, pumpage, and other related subjects are summarized.

Maps show the change of water level for the year Maps show the change of water level for the year 1970 and for the 5-year period 1966-70. For some areas hydrographs and daily records of water levels in wells equipped with recording gages are given. Mean monthly and mean-annual measure-ments of artesian heads in seven wells in the Roswell basin are reported. Data for 10 wells in the Rincon and Mesilla valleys were collected by the U.S. Bureau of Reclamation. Wells in the Roswell area of the Pecos River basin and in the San Simon Creek area of the Lower Colorado River basin are equipped with flowmeters. The reliability of the pumpage figures given for these areas is good. In some declared underground water basins where the total irrigated acreage is known, estimates of pumpage are based on precipitation and upon the average amount of water needed to raise crops, thus these estimates are fairly reliable. In 1970 there were about 1,256,130 acres of irrigated cropland in New Mexico; of these about 346,090 acres were irrigated with surface water only, 175,190 acres were irrigated with a combination of surface water and groundwater, and 734,250 acres were irrigated with groundwater only. (Knapp-W75-00624

THE AVAILABILITY OF WATER IN THE LIT-TLE LOST RIVER BASIN, IDAHO, Geological Survey, Lakewood, Colo For primary bibliographic entry see Field 4A. W75-00629

WORTH OF ADDITIONAL DATA TO A DIGITAL COMPUTER MODEL OF A GROUND-WATER BASIN, Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 2F.
W75-00630

FUTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN EAST CENTRAL FLORIDA, MAY 1974, Geological Survey With Geological Survey, Winter Park, Fla. For primary bibliographic entry see Field 7C.

SELENIUM IN THE WATER RESOURCES OF NEBRASKA IN COMPARISON TO PUBLIC HEALTH STANDARDS, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 5B. W75-00637

GROUND WATER IN PERSPECTIVE, Geological Survey, Reston, Va. R. L. Nace.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

In: Short Papers of the Eighth American Water nn: Short Papers of the Eighth American water Resources Conference, St Louis, Missouri, Oc-tober 30-November 2, 1972: American Water Resources Association Proceedings Series No 16,

Descriptors: *Groundwater, *Water storage, *Water management(Applied), Aquifers, Planning, Water resources development, Underground storage. Identifiers: Groundwater management.

For planning and development purposes, groundwater reservoirs are at least equal in importance to the groundwater itself. As regulators of water movement in the hydrological cycle, these reservoirs far surpass all lakes combined, natural and manmade. The amount of extractable groundwater in storage, worldwide, exceeds the annual water yield of all rivers of the world by a factor of at least 200. Overflow from aquifers provides most of the base flow of streams. Many problems could be met and many water shortages alleviated or eliminated by use of aquifers, not merely as sources of water, but as reservoirs for manage-ment of water. (Knapp-USGS) W75-00640

TEMPORARY STORAGE OF FRESH WATER IN A SALINE AQUIFER BY USE OF WELLS--A FIELD EXPERIMENT, Geological Survey, Winter Park, Fla.

C. H. Tibbals. In: Short Papers of the Eighth American Water Resources Conference, St Louis, Missouri, Oc-tober 30-November 2, 1972: American Water Resources Association Proceedings Series No 16,

p 69-70. 1 fig. 1 tab. 1 ref.

Descriptors: *Underground storage, *Artificial recharge, *Florida, Injection wells, Water management(Applied), Water storage, Aquifer characteristics, Hydrogeology, Artesian aquifers, *Feasibility studies.

The feasibility of storing freshwater in an aquifer that contains saline water was tested in a well field in Florida. The city of Cocoa, Brevard County, Florida, supplies water for much of central Brevard County, including Cape Kennedy and Patrick Air Force Base. The water supply is derived from a well field, located in east Orange County, which has a total pumping capacity of about 23 million gallons per day. All but one of the supply wells were drilled into the upper 500 feet of the Floridan aquifer, a 2,000-foot-thick artesian limestone aquifer whose top is about 250 feet below land surface. These wells are cased to about 250 feet and are finished as 'open hole' below this The feasibility of storing freshwater in an aquifer 250 feet and are finished as 'open hole' below this depth. However, one supply well (Cocoa 7-T) was constructed in a secondary artesian aquifer, a 13-foot-thick shell bed which occurs within the Hawthorn formation at a depth of about 75 feet. Cocoa 7-T, in the secondary artesian aquifer, is about 30 feet from Cocoa 7 and yields water with a chloride content of only 20 mg/liter. A cross-over pipe was installed between the two discharge lines that connect Cocoa 7 and Cocoa 7-T to the well field's main water-transmission line. The crossover pipe can be used to route the water pumped from Cocoa 7-T down the pump column of Cocoa 7 and into the Floridan aquifer. The recharge ex-periments indicate that a buffer zone can be established between the fresh and saline water and that a greater percentage of the recharged water can be recovered with each successive cycle. During this experiment, the dissimilarity of the rates of injection and withdrawal did not significantly influence, adversely or otherwise, the efficiency of the recharge operation. (Knapp-USGS)

THE RISING WATER TABLE IN THE WEST NUBARYA AREA OF EGYPT, International Inst. for Land Reclamation and Im-provement, Wageningen (Netherlands). F. E. Schulze, and N. A. de Ridder.

Nature and Resources, Vol 10, No 1, p 12-18, January-March 1974. 2 fig. 1 ref.

Descriptors: *Saturated soils, *Irrigation effects, Recharge, Water balance, Salinity, Leaching, Drainage systems.
Identifiers: *Egypt(Nubarya).

The introduction of irrigated agriculture and horticulture on the newly reclaimed land in the West Nubarya Project Area in Egypt has created problems including steady rise in water table, formation of local groundwater mounds and reversals of groundwater flow directions, and outflow of saline groundwater into the principal irrigation canals. Investigations by UNESCO cover not only the effects that reclamation and other engineering works are having, or may have, on soils and water tables, but include all the agronomic and socioeconomic aspects of the project. (Knapp-

ANALYSIS OF UNSTEADY FLOW TOWARD ARTESIAN WELLS BY THREE-DIMENSIONAL FINITE ELEMENTS,

Kentucky Water Resources Research Inst., Lexington. For primary bibliographic entry see Field 2F. W75-00693

HYDROGRAPH ANALYSIS OF CARBONATE AQUIFERS, Pennsylvania State Univ., University Park. Materials Research Lab. For primary bibliographic entry see Field 3B.

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGEMENT, VOLUME I: DEVELOPMENT OF THE GROUND WATER QUALITY MODEL, California State Dept. of Water Resources, Sacramento For primary bibliographic entry see Field 2F. W75-00702

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGMENT, VOLUME II: DEVELOPMENT OF HISTORIC DATA FOR THE VERIFICATION OF THE GROUND WATER QUALITY MODEL OF THE SANTA CLARA-CALLEGUAS AREA, UNDIVIDED A COUNTY VENTURA COUNTY,
California State Dept. of Water Resources, Sacra-

mento. For primary bibliographic entry see Field 2F. W75-00703

UNDERGROUND WASTE MANAGEMENT--A PEOPLE PROBLEM. Illinois State Geological Survey, Urbana For primary bibliographic entry see Field 5G. W75-00709

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND PART III--NUTRIENT TRANSPORT THROUGH THE SAND, Rensselaer Polytechnic Inst. Troy, N.Y. For primary bibliographic entry see Field 5B. W75-00744

TESTS OF A GROUNDWATER OPTIMIZATION TECHNIQUE, Stanford Univ., Calif. Dept. of Geology. K. A. Remson, E. Aquado, and I. Remson. Ground Water, Vol 12, No 5, p 273-276, September-October 1974. 1 fig, 1 tab, 5 ref.

*Water *Linear programming, *Water *Numerical analysis, Descriptors: management(Applied),

Aquifers, Analog models, *Groundwater, Model studies, Mathematical models, Analytical techniques, *Optimization, Equations, Finite element analysis. Identifiers: Steady-state. Two-dimensional

A problem involving the optimum location of wells for a steady-state, two-dimensional, confined aquifer was handled by first formulating a linear programming groundwater management model and then solving the model using IBM Mathematical Programming System/360. The results were then tested against those obtained using numerical and electric analog groundwater models. The optimal distributions of pumping and head as pre-dicted by the management model were verified. An improved optimal solution could be obtained by reformulating the management model using different constraints or a finer grid spacing. (Visocky-ISWS) W75-00746

OF GROUNDWATER FUTURE RESOURCES IN DUPAGE COUNTY. Illinois State Water Survey, Warrenville. Hydrology Section.
For primary bibliographic entry see Field 2F.

A METHODOLOGY FOR THE RAPID EVALUATION OF GROUNDWATER RESOURCES, SAO PAULO STATE, BRAZIL, Consulting Engineers Ltd., Tel Aviv (Israel) F. Mero, and Y. Gilboa. Hydrologic Sciences Bulletin, Vol 19, No 3, p 347-358, September 1974. 5 fig, 2 tab, 3 ref.

Descriptors: *Groundwater resources, *Recharge, Water balance, Aquifers, Groundwater, Surface waters, Rivers, Groundwater recharge, Geology, Hydrology, Hydrologic cycle, Flow, Precipita-tion(Atmospheric), Runoff, On-site investigations, Evaluation, Resources, Hydrographs, *Separation techniques. Identifiers: *Brazil(Sao Paulo).

The geology and hydrology of groundwater in Sao Paulo State, Brazil were presented. Well records were insufficient to estimate the potential yield of the aquifers. A methodology, based on separation of the surface and subterranean components of river discharge was presented. This separation technique was used to estimate the recharge for re-gional aquifers. (Adams-ISWS) W75-00761

ORTHOPHOSPHATE IN GROUND WATER, HALL COUNTY, NEBRASKA,
Nebraska State Dept. of Environmental Control, Lincoln. Water Pollution Control Div. For primary bibliographic entry see Field 5B.

A DATA ACQUISITION SYSTEM FOR TRANSIENT POROUS MEDIA EXPERIMENTS IN A SECTOR TANK, California Univ., Davis. Dept. of Water Science A. Orhun, and J. N. Luthin.

Water Resources Research, Vol 10, No 3, p 601-604, June 1974. 6 fig, 1 ref.

*Porous Descriptors: media, *Dupuit-Descriptors: *Porous media, *Dupuit-Forchheimer theory, *Data collections, *Groundwater movement, *Unsteady flow, Hydraulics, Instrumentation, Piezometers, Manometers, Electronic equipment, Measure-ment, Data processing, Computers, Laboratory tests Wells tests, Wells. Identifiers: Data acquisition system, *Sector tank, Data recording, Hewlett-Packard recorder, Wang

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

Experimental data were needed to verify computer solutions for the transient situation around a discharging well. A sector tank, filled with Oso discharging well. A sector tails, the word of the experimental verification. The tank was 0.2 rad and 23 ft (701.04 cm) long and 6 ft (182.9 cm) high. All pressure measurements were made by piezometers connected to a 'pressure junction box' where the pressures split to a manometer board and to a pressure transducer system by means of Scanivalve 063 T or X tube connectors. The manometer board was cut off from the pressure transducer system before each experiment. The data recording was accomplished with a digital recorder with a digital clock, a digital voltmeter with a dc multifunction unit, a digital scanner, two power supplies, an eventmeter, a home-built flip bucket device, and a 12-channel pressure transducer zero-adjust circuit box. Analysis of the data was done with the Wang DOX. Analysis of the data was done win the wang 700 programmable calculator. This data acquisi-tion system was simple, fast, and reliable for stu-dying groundwater flow problems under transient conditions. (Sanderson-ISWS) W75-00782

GROUND WATER COMPUTATIONS IN NEW

JERSEY, U.S.A., Columbia Univ., New York. For primary bibliographic entry see Field 2A. W75-00784

NONSTEADY FLOW TO A LARGE WELL IN A

LEAKY AQUIFER,
Wisconsin Univ., Milwaukee. Coll. of Applied
Science and Engineering.
R. Y. S. Lai, and C-W. Su. Journal of Hydrology, Vol 22, No 3-4, p 333-345, 1974. 9 fig. 5 ref.

Descriptors: *Groundwater, *Theoretical analysis, *Dug wells, *Water wells, *Water level fluctuations, Drawdown, Withdrawal, Mathematical models, Leakage, Transmissivity, *Unsteady flow, Aquifer characteristics, Aquicludes, Aquifers, Pumping. Identifiers: Large diameter wells, Storage in wells, Confining bed, Variable pumpage, Periodic pumpage, Laplace transforms, Arbitary pumping rates.

The exact solution for the drawdown in and around a well of large diameter in a homogeneous, isotropic leaky aquifer induced by a time-depen-dent pumping rate was presented. The effect of the storage capacity of the well was considered. The leakage was assumed to be at a rate proportional to the drawdown at any point in the aquifer, i.e., linear leakage proposed by Jacob in 1946 (Flow in a Leaky Artesian Aquifer, Transactions of the American Geophysical Union, Vol. 27, p 198-205). Typical drawdown curves were presented in graphs by numerical integration of the analytic solution for various time-dependent pumping rates. (Pricket-ISWS) W75-00795

THE MAP ABSTRACT (RESOURCES: ALABAMA, Geological Survey, University, Ala. OF WATER For primary bibliographic entry see Field 7C.

GROUNDWATER IN THE ALLUVIUM ALONG THE GREEN RIVER BETWEEN ITS MOUTH AND WOODBURY, KENTUCKY, Geological Survey, Louisville, Ky. For primary bibliographic entry see Field 7C. W75-00806

TION AND DRAINAGE: PROGRESS, PROBLEMS, AND OPPORTUNITIES. For primary bibliographic entry see Field 4A. W75-00964

DOWN-HOLE EH-PH PROBE AND WATER SAMPLER.

Commonwealth Scientific and Industrial Research Organization, Floreat Park (Australia). Div. of Mineralogy.

For primary bibliographic entry see Field 7B.

4C. Effects On Water Of Man'S Non-Water Activities

WATER QUALITY AFTER CLEARCUTTING A SMALL WATERSHED IN WEST VIRGINIA, Forest Service (USDA), Parsons, W. Va. Timber

and Watershed Lab. G. M. Aubertin, and J. H. Patric. Journal of Environmental Quality, Vol 3, No 3, p 243-249, 1974. 2 fig, 3 tab, 15 ref.

Descriptors: *Forest management, *Water quality, *Clear-cutting, Watersheds(Basins), West Virginia, Stream flow, Water temperature, Hydrogen ion concentration, Turbidity, Dissolved solids, Ammonia, Nitrates, Phosphates, Sulfates, Lumbering, Water chemistry, Conductivity, Nutrients, Road design.
Identifiers: Fernow Experimental Forest(W Va).

Forest cutting increases and reforestation decreases water yield. Conventional clearcutting is defined as the silvicultural method in which all trees are harvested in one cut; saleable logs and pulpwood are removed; culls, small stems, and all other undesirable trees remaining are cut or treated so they will not interfere with establishment of a new even-aged stand. A 34-ha gaged watershed at the Fernow Experimental Forest, West Virginia was conventionally clearcut in 1969. Streamflow increased 20 cm the first year after cutting but rapid and luxuriant revegetation reduced the flow increase to only 6.4 cm during the second year. Water quality remained high. Clearcutting had a negligible effect on the stream's temperature, pH, nonstorm turbidity, and concentrations of dissolved solids, Ca, Mg, Na, K, Fe, Cu, Zn, Mn, and ammonium nitrate. Storm-period turbidity, nitrate-nitrogen, and phosphate concentrations increased slightly while sulfate concentration decreased. Maximum nitrate-nitrogen concentration of 1.42 ppm was recorded during a 6.4-cm rainfall. Success in avoiding damage to water quality was attributed to careful road management, retention of forest strips along the stream, and rapid, lush vegetative regrowth after clearcutting. (Jones-Wisconsin) W75-00580

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, METROPOLITAN AREA, 1972, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 7C. W75-00620

SEDIMENT CHARACTERISTICS OF FIVE STREAMS NEAR HARRISBURG, PA., BEFORE HIGHWAY CONSTRUCTION, Geological Survey, Harrisburg, Pa. For primary bibliographic entry see Field 2J.

RAINFALL AND RUNOFF IN URBAN AREAS-A CASE STUDY OF FLOODING IN THE PIED-MONT OF NORTH CAROLINA, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 2A. W75-00638

THE INTRUSION OF LOGGING DEBRIS INTO ARTIFICIAL GRAVEL STREAMBEDS, Oregon State Univ., Corvallis. Water Resources Research Inst. For primary bibliographic entry see Field 5B. W75-00695

AN ANALYSIS OF DAILY PRECIPITATION PATTERNS IN AND AROUND THE NEW YORK CITY AREA AND THE POSSIBLE EFFECTS OF THE URBAN AREA ON THESE PATTERNS, Rutgers - The State Univ., New Brunswick, N.J. For primary bibliographic entry see Field 2B. W75-00706

STREAMFLOW GREATLY REDUCED BY CON-VERTING DECIDUOUS HARDWOOD STANDS Forest Service (USDA), Franklin, N.C. Coweeta

Hydrologic Lab. For primary bibliographic entry see Field 4D. W75-00793

INFLUENCE OF AIR TEMPERATURE AND SOLAR RADIATION ON SNOWMELT RUNOFF FROM A SMALL WATERSHED, Ottawa Univ. (Ontario). Dept. of Civil Engineer-For primary bibliographic entry see Field 2C. W75-00890

RELATION OF WIND EXPOSURE AND FOREST CUTTING TO CHANGES IN SNOW ACCUMULATION, Forest Service (USDA), Moscow, Idaho. Forestry Sciences Lab. For primary bibliographic entry see Field 3B. W75-00919

URBAN RUNOFF QUALITY AND MODELING Nebraska Univ., Lincoln. Dept. of Civil Engineer-For primary bibliographic entry see Field 5B. W75-00972

PRESCRIBED FIRE EFFECTS ON PHYSICAL AND HYDROLOGICAL PROPERTIES OF MIXED-CONIFER FOREST FLOOR AND SOIL, California Univ., Berkeley. School of Forestry and Conservation.

and Conservation.
J. K. Agee.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237
291, \$4.25 in paper copy, \$2.25 in microfiche.
University of California at Davis, Water
Resources Center, Contribution Report No 143,
July 1973, 57 p, 14 fig. 35 tab, 3 append, 101 ref.
OWRT A-044-CAL(1) and B-151-CAL(1).

Descriptors: *Mixed forests, *Burning, *Forest soils, *Hydrologic properties, *Model studies, Water yield, Forest fires, Coniferous forests, Vegetation, Soil profile, Infiltration, Bulk density, Temperature, Soil structure, Surfactants, Soil properties, Surface runoff, Erosion, Sediments, Weather, Water properties, Rainfall simulators. Identifiers: *Prescribed burning, Fuels, Fuel moisture, Forest floor. moisture. Forest floor.

Prescribed fires were applied to mixed-conifer ecosystems in the Sierra Nevadas. The weight, depth, and water-holding capacity of fine fuels were reduced, but aerial and heavy fuels were not affected. Wettability of the forest floor was afaffected, and some water repellency properties were transferred to the soil. Water runoff, and to a lesser extent, sediment yield were increased by burning. A computer model was developed using forest floor depth as a runoff and erosion hazard index. The model can be used to meet burning program objectives while minimizing erosion

Identification Of Pollutants—Group 5A

problems. Results show the prescribed fires have a more significant effect on the physical and and hydrologic properties of ponderosa pine-incenseocdar sites than white fir-giant sequoia sites. The inherent erodibility of soil under the former, as well as its more flammable characteristics, are presented as factors in the difference. Characteristics of fire, vegetation, forest floor, and soil-water are described. (Mastic-Arizona)

4D. Watershed Protection

W75-00597

ROCK SAUSAGE FALL VELOCITY MEASURE-MENTS,

Connecticut University, Storrs. For primary bibliographic entry see Field 8D. W75-00551

LAND USE CONTROLS IN WATERSHED AND AOUIFER RECHARGE AREAS. For primary bibliographic entry see Field 4B.

STREAMFLOW GREATLY REDUCED BY CON-VERTING DECIDUOUS HARDWOOD STANDS

Forest Service (USDA), Franklin, N.C. Coweeta

Hydrologic Lab.

W. T. Swank, and J. E. Douglass. Science, Vol 185, No 4154, p 857-859, September, 1974. 2 fig, 9 ref.

Descriptors: *Streamflow forecasting, *Forest watersheds, *Appalachian mountain region, Streamflow, Watershed management, *North Streamflow, Watershed management, *North Carolina, White pine trees, Evapotranspiration, Hardwood, Demonstration watersheds, Forests. Identifiers: *Coweeta Hydrologic Laboratory.

Fifteen years after two experimental watersheds in the southern Appalachians were converted from mature hardwood cover to white pine, annual streamflow was reduced. After crown closure of the white pine, the annual streamflow reduction stabilized at about 200 mm (20%) below that expected for hardwood cover. Streamflow reduction reductions occurring in the dormant and early growing seasons. This effect is the result of greater interception loss for the young white pine stand. (Adams-ISWS) W75-00793

KNIFE LAKE IMPROVEMENT RC AND D MEASURE ONANEGOZIE RC AND D PRO-JECT, KANABEC COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATE-

MENT), Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 4A. W75-00930

CRAWFORD CREEK SUBWATERSHED PRO-CHAWFORD CREEK SUBWATERSHED, PROJECT, LITTLE SIQUX RIVER WATERSHED,
IDA COUNTY, IOWA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Des Moines, Iowa.
Available from National Technical Information

Service, U.S. Dept. of Commerce, Springfield, Va 22161 as EIS-IA-74-0019-F, \$3.75 in paper copy, \$2.25 in microfiche. January 2, 1974. 35 p, 3 tab, 2

Descriptors: *Environmental effects, *Iowa, *Watershed management, *Recreation, *Soil conwatersned management, "Recreation, "Soil conservation, Federal government, Excess water(Soils), Water management(Applied), Watersheds(Divides), Conservation, Engineering structures, Land management, Erosion control, Reservoirs, Flood protection, Flood control, Multiple-purpose structures, Administrative agencies, Recreation facilities, Gully erosion, Sheet erosion, Soil erosion, Flooding, Water resources develop-

ment, Land resources.
Identifiers: *Environmental Impact Statements, Little Souix River(Iowa).

This project is located in northwestern Iowa and provides for conservation land treatment measures over 464 acres of land, 14 grade stabilization structures for the prevention of gully erosion, and one multiple-purpose structure for grade stabiliza-tion, floodwater retardation, and recreation, including recreational facilities. The project area consists primarily of agricultural lands which are subject to sheet and gully erosion and, in some areas, wet soil conditions. Flooding is a problem in the lower reaches. The project will reduce erosion and flood damage, provide additional recreational facilities, provide 125 acres of aquatic habitat, and improve wildlife habitat on 60 acres. 5.9 miles of stream habitat will be lost, 125 acres of cropland and wildlife habitat will be permanently inundated, and terrestrial wildlife use of 207 acres will be tem-porarily interrupted during construction. Land treatment alone and no action were considered as alternatives and deemed inferior to the proposed action. This work is expected to enhance the long-term development of the area and there is no significant opposition to the project. (Deckert-Florida) W75-00935

COASTAL STABILISATION AT BARTON-ON-

SEA, For primary bibliographic entry see Field 6B. W75-01006

SOIL EROSION AND SILTATION WITHIN THE

MURRAY VALLEY (AUSTRALIA), Soil Conservation Service of New South Wales, Sydney (Australia). F. R. Higginson.

Journal of the Soil Conservation Service of New South Wales, Vol 30, No 3, p 135-144, July 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Soil erosion, *Sediment loads, *Australia, River basins, Sedimentation rates, Regions, Reservoir silting, Watersheds(Basins), Administrative agencies, *Erosion control, Soil types. Identifiers: *Murray Valley(NSW).

The extent of the problem of soil erosion in the area of New South Wales bordered by the River Murray is summarized by area, and related to major soil types. Sedimentation in the forested Eastern region, as judged by reservoir siltation, appears to be low by overseas standards. In the central and western areas, only limited data are presently available, but the indications are of a much higher rate of sedimentation than in the east. The administration of control measures for the region is briefly described. (CSIRO) W75-01010

TUNNEL EROSION--A FIELD STUDY IN THE RIVERINA,

Soil Conservation Service, New South Wales

Journal of the Soil Conservation Service of New South Wales, Vol 30, No 3, p 145-156, July 1974. 4

Descriptors: *Erosion control, *Land management, Soil erosion, Soil conservation, Contour farming, Pastures, Rainfall, Dry seasons, Summer, Pest control, Cultivation, Deep tillage, Identifiers: *Tunnel erosion, *Riverina(N.S.W.),

Two field trials in the Riverina region of New South Wales, Australia, are described, in which the occurrence and alleviation of tunnel erosion in relation to agronomic management were studied. The results indicated that other factors, particularly rainfall, often override soil and management factors; tunnel activity increases after heavy rain, especially if the rain falls in the summer season. However, the extent of the damage can be considerably reduced by practices such as establishing and maintaining a vigorous (and preferably perennial) pasture, deep ripping on the contour to break up existing tunnels, and the eradication of rabbits. (CSIRO) W75-01011

THE INFLUENCING OF AGGREGATE STA-BILITY, PLASTICITY AND WATER RETEN-TION IN SOIL STABILIZATION WITH MEDI-UM AND HIGH APPLICATIONS OF CALCIUM HYDROXIDE, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W75-01048

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE ECOLOGY OF THE NAVASOTA RIVER, TEXAS, Texas A and M Univ., College Station. Water

Resources Inst. For primary bibliographic entry see Field 2E. W75-00558

THE MANUAL DETERMINATION OF AM-MONIA IN FRESH WATERS USING AN AM-MONIA-SENSITIVE MEMBRANE-ELEC-TRODE.

Water Research Association, Marlow (England). M. J. Beckett, and A. L. Wilson. Water Research, Vol 8, No 6, p 333-340, 1974. 1

Descriptors: *Analytical techniques, *Equipment, Identifiers: Potentiometric sensor.

The use of a commercially-available ammonia-sensitive membrane-electrode for the manual determination of ammonia is discrete samples of fresh water was investigated and the analytical procedure is described. Results of earlier workers are also compared. Principles and construction of the probe are given. The electrode is simple and convenient to use, and a sample can be analyzed in a few minutes. For normal routine analysis, the lower limits of determination is approximately 0.1 mg N/l though smaller concentrations can be mea sured. The relative standard deviation of analytical results varied from approximately 10 to 3% as ammonia concentration increased from 0.1 to 4 mg N/l. Results for samples of river water agreed well with those obtained by absorptiometric methods of analysis; the electrode responds to amines but otherwise appears to be essentially specific for ammonia. Use of the electrode will be advantageous in a number of applications and it also has good potential for the on-line analysis of fresh waters. Further work on river waters is required to confirm its suitability for this purpose. (Jones-Wisconsin)

OBSERVATIONS OF WATER, AIR AND SOIL POLLUTION IN ISRAEL AND VICINITY FROM THE ERTS-L IMAGERY, Tel-Aviv Univ. (Israel). Dept. of Environmental

Nater, Air, and Soil Pollution, Vol 3, p 53-61, March 1974. 3 fig, 1 tab, 12 ref.

Group 5A—Identification Of Pollutants

Descriptors: *Research, *Agriculture, Hydrology, Water pollution, Oil spills, Mines, Crops, Satel-

lites(Artificial), Identifiers: "Radiometric methods, Earth Resources Technology Satellite Program(ERTS), "Israel, Mine effluents, Copper mines, Space

Israel is a participant in the Earth Resources Techology Satellite Program (ERTS). The imagery of Israel and its vicinity taken by the Multi Spec-tral Scanner of the ERTS-1 Satellite has been the subject of analysis in a multi-disciplinary research program. The objectives were to map agricultural crops, mainly wheat and orange groves, to map natural vegetation, and to study Israeli hydrology, arid regions, geology, and oceanography. Cases of water, air, and soil pollution have been observed in the imagery on several dates. These are: oil slicks in the Gulf of Suez and possibly near Haifa; smoke plumes, extending over some 100 km in a nearly straight line along the Gulf of Suez, and soil pollution caused by copper mine effluents in the Araya Valley in Israel. The images of these cases of pollution are presented and 'space signatures' cases of pollution as seen from space) are also given. (Prague-FIRL) W75-00596 (the radiometric spectral characteristics of these

METHOD FOR THE MONITORING OF LIQUID FLOW AND AN AUTOMATIC FLOW CONTROLLER TO BE USED FOR THIS METHOD. For primary bibliographic entry see Field 7B. W75-00602

DETECTING PARTICLES IN LIQUIDS.

Emhart Corp. Sydney (Australia). Australian Patent 446,177. Issued January 4, 1973. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 9, p 900-901, March 4, 1974.

Descriptors: *Liquids, Computers, *Patents, Automation, Inspection, Monitoring, *Pollutant identification.
Identifiers: *Video voltage patterns.

A method of inspecting transparent liquid filled containers for foreign particles comprises the steps of: spinning the container to cause the liquid contents to swirl; stopping the container while the liquid contents continue to swirl; generating a first video voltage pattern as a result of scanning the container and contents with a video camera; providing timed digital voltage pulses corresponding to any peak portions of the first video voltage pattern which exceed a predetermined threshold voltage; and storing the timed pulses for sub-sequent recall from a memory device. Following this, methods involve: generating a succeeding video voltage pattern as a result of scanning the container and contents with a video camera at a later instant of time; altering the threshold voltage during the succeeding voltage pattern so that the threshold voltage is decreased at the location cor-responding to each peak portion of the first video voltage pattern; digitizing the succeeding video voltage pattern to provide a voltage trace with pulses corresponding to peak portions; synchronizing the first and succeeding digitized video voltage patterns; and comparing the first and succeeding digitized voltage patterns by electronically com-paring one to the other. (Prague-FIRL) W75-00614

WATER RESOURCES DATA FOR COLORADO, 1973: PART 2--WATER QUALITY RECORDS. Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 7C. W75-00625

WATER-POLLUTION ASSESSMENT AND ASTM COMMITTEE D-19, Geological Survey, Lakewood, Colo. Water Resources Div.

M. Skougstad. Standardization News, Vol 2, No 8, p 16-20, Au-

Descriptors: *Water pollution control, *Water analysis, *Pollutant identification, *Analytical techniques, Water quality, Research and develop-ment, Sampling, Laboratory tests, Water chemis-

Identifiers: ASTM Committee D-19.

American Society of Testing and Materials Committee D-19 strives to maintain close liaison with all sectors of the technical community, including government regulatory agencies and the private sector. The Committee's goal is to provide truly consensus standard methods for critically describing national water resources in order to provide a reliable scientific basis for making sound management decisions to reverse the trend toward increased fouling of lakes, streams, and ground-water reservoirs. The current programs for Comwater reservoirs. The current programs for Committee D-19 are outlined in respect to new measurement techniques and the measurement problems in this area. (Knapp-USGS) W75-00636

THE RELATIONSHIP BETWEEN LITHOLOGY AND TRACE-ELEMENT CONTENT OF GROUND WATER, Geological Survey, Rolla, Mo. Water Resources

For primary bibliographic entry see Field 2F. W75-00643

PROCEEDINGS OF NAVAL ENVIRONMENTAL PROTECTION DATA BASE, INSTRUMENTA-TION WORKSHOP.
Available from NTIS, Springfield, Va 22161 as AD-772 547, \$8.50 in paper copy, \$2.25 in microfiche. Proceedings of Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, 1972, 266 p. tion, 1972. 266 p.

Descriptors: *Data collections, *Monitoring, *Water pollution, *Air pollution, *Military aspects, Ships, Waste water treatment, Water pol-lution control, Conferences, *Instrumentation.

A workshop was held to recommend techniques and instrumentation for the Navy Environmental Data Base. Information was collected on the stateof-the-art of instrumentation and techniques. The workshop objectives were to recommend techniques and instrumentation, exchange stateof-the-art information on instrumentation and techniques with other activities, open and expand avenues of communication with other environ-mental activities, and provide a vehicle for partici-pants to review and update their techniques and in-strumentation needs. (See W75-00645 thru W75-00664) (Knapp-USGS)

INSTRUMENTATION FOR WATER AND WASTEWATER ANALYSES, National Environmental Research Center, Cincin-WATER AND

nati. Ohio.

In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 4-8, 1972.

Descriptors: *Analytical techniques, *Pollutant identification, *Instrumentation, Gas chromatography, Mass spectrometry, Flame photometry, Electrodes, Ions, Spectrophotometry. Identifiers: Polarography.

A variety of analytical instruments are available for environmental measurements. Gas chromotography is one of the most reliable approaches to the

determination of trace organic contaminants, including pesticides and herbicides. The advent of the gas chromatograph-mass spectrometer com-bination has greatly increased the ability to define organic structures. Nuclear magnetic resonance and spark-source mass spectrometry provide addi-tional elemental characterization. Infrared spectrophotometry is a standard tool for the identification of organic compounds. The atomic absorption spectrophotometer greatly assists in the determination of metals. When information on the specific form of the metal is required, polarography offers distinct advantages. Both conventional and anodic stripping techniques are available. ble for these measurements. Anodic stripping has an additional advantage in yielding sensitivities in the range of micrograms per liter. Electrode measurement of specific ions is now possible in many waste samples. Carbon analyzers are now available which can be used to measure the organic content of a sample. Many of the colorimetric procedures used in waste analyses can be performed efficiently and automatically. They are used for measurement of ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, phosphorus, fluoride, sulfate, Methylene Blue Active Substance (MBAS), phenols, and many other water quality parameters. Continuous automatic instruments are used for river monitoring and as waste monitors. (See also W75-00644) (Knapp-USGS) W75-00645 ble which can be used to measure the organic con-

INSTRUMENTATION FOR UNDERWATER NUCLEAR RADIATION MEASUREMENTS, Naval Undersea Center, San Diego, Calif. E. J. Wesley.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 9-17, 1972.

Descriptors: *Pollutant identification, *Monitoring, *Underwater, *Radioactive wastes, *Instrumentation, Radioactivity, Background radiation, Radioistotopes, Water pollution control.

Radioactivity in ocean waters may be surveyed at levels well below the usual natural background. Survey instrumentation can be used to measure the extent to which man may introduce radioactivity in water by a very sensitive underwater de-tector array. The results of surveys at sea off San Diego disclosed patchy concentrations of radioactivity in the near-surface layer of the ocean. The underwater towed detector is an eight-probe array consisting of eight 2-inch-diameter by 8-inch-long detectors located in the eight spokes of a wheel. (See also W75-00644) (Knapp-USGS) W75-00646

WASTEWATER INSTRUMENTATION. Air Force Weapons Lab., Kirtland AFB, N. Mex. Environics Lab. D. D. Nelson.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 18-20, 1972.

*Instrumentation. *Monitoring, Descriptors: *Water pollution control, Waste water treatment, Research and development, Military aspects, Reviews, Water quality, Water pollution.

Availability of wastewater instrumentation is under review for the U.S. Air Force. The measureunder review for the U.S. Air Force. The measure-ments of interest are hydraulic loading, color, tem-perature, filterable solids, organic loading, total cyanide, mercury, silver, copper, turbidity, PH dissolved oxygen, dissolved solids, residual chlorine, total oils and grease, free oils and grease, cadmium, lead, nickel, iron, phenol, surfactants, nitrates, nitrites, zinc, total chromium, hexavalent chromium, total phosphates, organic phosphates,

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and total nitrogen. Instruments that monitor these 30 parameters could be placed in three categories: instrumentation which has sufficient user data to verify its reliability; instrumentation that is currently available on the shelf and that is advertised by the manufacturer to be reliable, that however has insufficient user data permission to verify its reliability; and instrumentation for which an R and D requirement exists for development. (See also W75-00644) (Knapp-USGS) W75-00647

NAVY ENVIRONMENTAL QUALITY GUIDES

FOR OFFSHORE AREAS, Naval Oceanographic Office, Washington, D.C. For primary bibliographic entry see Field 5G.

WASTEWATER MONITORING--THE STATE OF THE ART, Army Environmental Hygiene Agency, Edgewood Arsenal, Md. C. Kenison.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil

Engineering Laboratory Publication, p 26-37, 1972. 6 fig, 8 tab. Descriptors: *Monitoring, *Water pollution control, *Military aspects, Instrumentation, Water quality, Waste water treatment, *Reviews.

A short review of Army wastewater monitoring is presented, followed by a discussion of future trends which are anticipated by the Army in considering requirements for monitoring. Desired characteristics of wastewater monitoring programs are reviewed, together with the state of the art of in situ, direct reading detectors. Sample collection and analytical options open to the designer of a wastewater monitoring program are con-sidered. Immediate needs to improve the Army's wastewater monitoring posture are discussed. (See also W75-00644) (Knapp-USGS) W75-00649

INDUSTRIAL WASTEWATER INDUSTRIAL WASTEWATER SAMPLING METHODS AT NORTH ISLAND, Naval Air Rework Facility, San Diego, Calif. B. A. Longley-Cook, and M. T. Longley-Cook. In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 38-39, 1977

Descriptors: *Monitoring, *Water pollution sources, *Military reservations, *California, *Sampling, Water pollution control, Waste water disposal, Flow measurement.

North Island Naval Air Station, California, was selected to be one of the pilot test sites of the Environmental Protection Data Base. These tests are conducted by the Naval Air Rework Facility at North Island in the areas of water pollution, toxic chemical seepage, air pollution, noise pollution, and mathematical modeling. In the area of water pollution, the sources of pollutants are chiefly the pollution, the sources of pollutants are chiefly the many industrial complexes of the rework facility. Major sources include plating shops, jet engine test cells, and paint and strip operations. Almost all of the industrial wastes are discharged into San Diego Bay via the storm drainage system. An estimated one million gallons a day of industrial waste is discharged from 18 outfalls. (See also W75-00644) (Knapp-USGS) W75-00659) W75-00650

WATER QUALITY MONITORING National Ocean Survey, Rockville, Md. In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 40-43, 1972. 2 fig.

*Monitoring, Descriptors: *Instrumentation, Automation, Telemetry, Data collections, Data transmission, Data processing.

The ODESSA system measures temperature, conductivity, and depth, plus current speed and direction. These five parameters constitute one sensor package, and one buoy station can accommodate up to eight sensor packages. The system employs a technique to digitize the output at each sensor, avoiding degradation of the data by subsequent handling procedures. These digital measurements are initiated by a telemetered command or a preset timer and may be recorded on magnetic tape in the buoy and radio-telemetered to a central recording station for monitoring and the generation of a computer compatible magnetic tape record. (See also W75-00644) (Knapp-USGS)

TESTING OF WATER QUALITY INSTRUMEN-

TATION AT NOIC, National Oceanographic Instrumentation Center, Rockville, Md. B. Pijanowski.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 44-46,

Descriptors: *Instrumentation, *Calibrations, *Oceanography, Water quality, Research and development, Testing, Evaluation, Research

National Oceanographic Instrumentation Center has a unique capability in testing facilities and marine instrument calibration programs and a great deal of expertise in many areas of oceanographic instrumentation systems. To better serve the national need, a regional center concept has been adopted. There now exist regional centers in Bay St. Louis, Mississippi, and Seattle, Washington, with another planned for the near future in San Diego, California. These regional centers have many of the capabilities of the main center in Washington and offer closer geographical contact with other parts of the country. Basically, NOIC is a service organization. NOIC performs tests, evaluations, and calibrations of ocean-related instruments and systems. As part of the test and evaluation program, commercially available inevaluation program, commercially available instruments are procured and then run through extensive testing for performance evaluation. Test results are published in the form of Instrument Fact Sheets and Technical Bulletins, both of which are available to the entire oceanographic community. (See also W75-00644) (Knapp-USGS) W75-00652

A SYSTEM FOR AUTOMATIC DATA ACQUISITION, Army Engineer, Waterways Experiment Station, Vicksburg, Miss. A. N. Williamson.

In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 47-56, 1972. 7 fig.

Descriptors: *Data collections, *Automation, Data storage and retrieval, Instrumentation, Equipment, Hydrologic data. Identifiers: Automatic data collection.

A data collection system was developed to automatically (a) collect and record data at regular intervals over a period of time or at prescribed times

with manual operation. (b) sort and store collected data in a manner that permits easy retrieval, and (c) present the data in usable forms. The system substantially reduced data collection errors and costs that normally result when conventional data collection techniques are used. The recorder is designed to accept analog voltage inputs from as many as 20 different sources. In addition, it can accept the input from a hand-held control unit, thus permitting data to be recorded manually on magnetic tape. The recorder can be interfaced with any type of sensor whose output signal can be conditioned to provide a DC signal to the recorder in the range of 0 to 100 mv with 100% overranging. Thus, the recorder can be used with a number of different types of sensors, such as thermistors, solar meters, rain gages, wind-speed and winddirection sensors, and water pH, conductivity, depth, and dissolved oxygen probes. (See also W75-00644) (Knapp-USGS) W75-00653

CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF TNT, RDX, AND HMX EXPLOSIVES IN INDUSTRIAL WASTEWATER, Naval Ammunition Depot, Crane, Ind. S. D. Maegerlein.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 57-62, 1972. 2 fig, 1 tab.

*Pollutant identification. Descriptors: *Chromatography, Explosives. water(Pollution), Water pollution sources, Organic compounds, Industrial wastes, Nitrates. Identifiers: *TNT, *RDX, *HMX.

Some common aromatic and heterocyclic explosives may be analyzed in wastewater by reversedphase liquid chromatography. A procedure is described for determining 2, 4, 6-trinitrotoluene (TNT), hexahydro-1, 3, 5-trinitro-s-triazine (RDX) and octahydro-1, 3, 5, 7-tetrazocine (HMX). The method, based on automated liquid chromatography of the filtered wastewater, utilizes an ultraviolet spectrophotometer to detect the explosives. The limits of detection are: TNT, 0.2 ppm; RDX, 0.5 ppm; and HMX, 1.0 ppm. (See also W75-00644) (Knapp-USGS)

WATER QUALITY MEASUREMENTS AT PEARL HARBOR, Navy Environmental Protection Data Base, Honolulu, Hawaii. Pearl Harbor Div. M. L. Iverson.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 63-70, 1972. 5 fig. 2 tab, 3 ref.

Descriptors: *Water quality, *Monitoring, *Harbors, *Hawaii, Data collections, Instrumentation, Equipment, Water analysis, Spectrophotometry, Gas chromatography.

Identifiers: *Pearl Harbor(Hawaii).

The Navy Environmental Protection Data Base (EPDB) measurements at Pearl Harbor have been in progress since September 1971. The laboratory analyzes water samples from harbor sampling stations, streams and source stations and also sediment samples from Pearl Harbor. An atomic absorption spectrophotometer is equipped with hollow cathode lamps for the analyses of 15 metals and an accessory kit for the analyses of mercury, selenium, and arsenic. The Auto Analyzer II is a dual-channel instrument and is equipped with manifolds for the analyses of nitrite, nitrate, am-monia, Kjeldahl nitrogen, and chloride. Phosphorus nutrients are presently being deter-mined by manual methods. A total carbon analyzer is used for the analyses of the inorganic and total

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carbon content in water. A gas chromatograph is equipped with an electron capture and flame ionization detector in addition to a thermoconductivity detector. The chromatograph will be used initially for the analysis of chlorinated hydrocarbons. (See also W75-00644) (Knapp-USGS) W75-00655

STORAGE EFFECTS AND MERCURY ANALY-

SIS OF NATURAL WATERS, Naval Research Lab., Washington, D.C. R. A. Carr, and P. E. Wilkniss.

In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 71-79, 1972. 7 fig, 8 ref.

Descriptors: *Water analysis, *Analytical techniques, *Mercury, Chemical analysis, Sampling, Spectrophotometry.

Analysis of natural waters for mercury requires understanding of changes occurring during storage, such as losses to container walls, association with particulate phases, and vaporization. Use of carrier-free Hg-197 and improved flameless atomic absorption techniques showed negligible losses to sample containers upon 8-day storage at pH=1. At the time of sampling, 80% of the total mercury was associated with particulates, while at the end of the storage period only 10% to 15% was associated with particulates. No vaporization losses were observed under these conditions. (See also W75-00644) (Knapp-USGS) W75-00656

ANALYSIS OF MERCURY, LEAD AND OTHER METALS IN ENVIRONMENTAL SAMPLES, Naval Undersea Center, San Diego, Calif. Chemi-

Navai Undersea Center, San Diego, Catif. Chemi-cal Oceanography Branch. S. Yamamoto, H. V. Weiss, and A. Zirino. In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 80-86, 1972. 3 fig, 1 tab, 6 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Trace elements, Water analysis, Mercury, Lead, Neutron activation analysis, Xray fluorescence.
Identifiers: Voltammetry, Anodic stripping vol-

tammetry.

Three methods of trace metal analysis are potentially applicable to the Environmental Pollution Data Base program. These methods are (1) neutron activation analysis, (2) anodic stripping voltam-metry and (3) nondispersive X-ray fluorescence analysis. Nondispersive X-ray fluorescence analysis is primarily useful for the analysis of solid materials. Although this method is not as sensitive as neutron activation analysis or anodic stripping voltammetry, it offers advantages in that non-destructive, multielement analysis is possible. The greatest usefulness of this method is to quickly and economically scan a sample for pollutants. If radioisotopes are used, the system can be packaged for use in the field for monitoring purposes. (See also W75-00644) (Knapp-USGS) W75-00657

PROBLEMS OF STORING AND ANALYZING MERCURY SAMPLES COLLECTED IN A NEARSHORE ENVIRONMENT,

Naval Oceanographic Office, Washington, D.C.

J. D. Gassaway, and R. A. Carr. In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 87-92, 1972. 2 fig, 1 tab, 5 ref. Descriptors: *Mercury, *Sampling, *Chemical analysis, *Sea water, Water analysis, Trace elements, Water pollution, Pollutant identification, Water pollution sources.

In most marine pollution investigations, trace metal samples must be shipped to the laboratory for analysis. Because of the potential loss of mercury in storage, techniques to minimize his loss were studied. Eight 1-liter samples were tagged with 5 ml of a Hg-203 solution; four of these sam-ples were pickled with concentrated nitric acid, and all of these samples were stored at room tem-perature for one month. Simultaneously, twentyfour 1-liter samples were prepared in the exact same way and frozen. Five-ml aliquots of the samples were counted every other day over a 30-day period. The untreated samples which were stored at room temperature showed a large variation between individual samples within the group and also with respect to the calculated decay curve. The frozen samples varied from the calculated decay curve by as much as 14% and varied 10% from each other. The samples pickled with nitric acid showed the smallest deviation from the calculated decay curve, approximately 8%, with all samples of the group falling within the counting error of 3%. The nitric acid technique is recommended for sample storage. From 50 discrete points, replicate samples were taken at Mayport, Florida, treated and analyzed at the laboratory 10 days later by the cold-vapor atomic absorption technique. They had an average value of 41+26 ng/liter. This value is well within the range of previously reported values of mercury in sea-water. (See also W75-00644) (Knapp-USGS)

BIOLOGICAL FIELD METHODS,

Naval Underwater Systems Center, Newport, R.I. Dept. of Ocean Science. C. L. Brown, Jr.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 93-99, 1972. 14 ref

Descriptors: *Sampling, *Biological communities, Water pollution effects, Investigations, Environment, *Pollutant identification.

Because of the variability in habitats, modes of living, life cycles, sizes and abundances of aquatic organisms, methods for collecting must differ. Field methods are grouped into four categories as they apply to the major habitats: bottom (or benthic) organisms; plankton; the periphyton (attached) community, which resembles both the plankton and the benthos; and fish. A definite pol-icy should be established as to the size range of organisms to be collected and counted. For ecological analysis and interpretation, every collection should be associated with a record of environmen-tal conditions at the time of collection. (See also W75-00644) (Knapp-USGS)

FIELD MEASUREMENTS REQUIRED FOR VERIFICATION OF POLLUTION DISPERSION COMPUTATIONS WITH HYDRODYNAMICAL-NUMERICAL MODELS,

Environmental Prediction Research Facility (Navy), Monterey, Calif. For primary bibliographic entry see Field 5B. W75-00660

WATER POLLUTION, SHIPS' WASTE-WATERS, WATER QUALITY MEASUREMENT, Naval Ship Research and Development Center, Annapolis, Md.

For primary bibliographic entry see Field 5B. W75-00661

OIL-IN-WATER MONITORING AND MEASUR-Naval Ship Research and Development Center, Annapolis, Md.

P. Schatzberg. In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 127-139,

Descriptors: *Oily water, *Monitoring, Separation techniques, Oil pollution, Water pollution control, Waste water treatment. Instrumentation.

Precise, dependable measurements of oil in water are needed to monitor the performance of oil/water separation processes, establish environ-mental pollution indexes, and establish compliance with applicable regulations. Information is presented on preliminary specifications for ship-board oil-in-water monitors as well as operating principles of several monitors to be evaluated at the Annapolis Laboratory, Naval Ship Research and Development Center. Results are presented of recent laboratory experiments for measuring con-centrations of oil in water in a moving stream. (See also W75-00644) (Knapp-USGS) W75-00662

AERIAL COASTAL OCEANOGRAPHY AND POLLUTION SURVEILLANCE,

Naval Underwater Systems Center, New London, Conn

J. J. Gallagher.

In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 140-149, 1972. 3 fig, 1 tab, 11 ref.

Descriptors: *Remote sensing, *Monitoring, *Water pollution, Path of pollutants, Aerial photography, Infrared radiation, Coasts, Continental shelf, *New York, *Connecticut. Identifiers: *Long Island Sound(NY).

Aerial monitoring of sea surface temperatures using infrared radiometry is being conducted over Block Island Sound, eastern Long Island Sound, Narragansett Bay, and near the Thames River, Connecticut on a weekly flight schedule. A cooperative ground-truth data collection network supports the aerial measurements. The most promising aerial photographic remote sensing echniques to detect and identify waterborne pollutants are multispectral image acquisition and image enhancement interpretation. Attempts are being made to optimize film/filter combinations in the wavelength spectrum from 0.3 to 1.3 microns. (See also W75-00644) (Knapp-USGS) W75-00663

ENVIRONMENTAL QUALITY MONITORING

RESEARCH,
Army Medical Environmental Engineering
Research Unit, Edgewood Arsenal, Md.

K. Guter. In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 245-248,

Descriptors: *Monitoring, *Water quality, *Research and development, *Military aspects, Waste water disposal, Pesiticides, Waste disposal, Waste water treatment

The US Army Medical Research and Development Command environmental quality research is described. The program includes evaluation of the health and welfare effects of land disposal of wastewaters, evaluation of problems associated with direct wastewater reuse, evaluation of the health effects of pesticide disposal, development

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of air and water standards relating to military pollutants, evaluation of the health and welfare aspects of solid waste disposal, development of criteria for improved performance of Army wastewater treatment facilities, and development of improved air and water pollution monitoring methods. (See also W75-00644) (Knapp-USGS) W75-00664

STATISTICAL ANALYSES USED IN THE COM-PARISON OF THREE METHODS OF FRESH-WATER ZOOPLANKTON SAMPLING, Kongelige Norske Videnskabers Selskab, Trondheim. Museet. For primary bibliographic entry see Field 5C.

W75-00688

WATER QUALITY MONITORING: BACTERIA

AS INDICATORS, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resource Research Center. J. H. Bowdre, and N. R. Krieg.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 061, \$3.25 in paper copy, \$2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 69, February 1974. 20 p, 2 fig, 2 tab, 14 ref. OWRT A-999-VA(19).

Descriptors: *Bacteria, *Monitoring, *Water quality, *Bioindicators, Industrial *Pollutant identification, Toxicity. Identifiers: Flagella, Spirillum volutans. Industrial wastes.

A rapid, simple, and inexpensive standardized method has been developed for biological monitoring of levels of toxicants in industrial effluent using motility of Spirillum volutans as an indicator. The system was sensitive to zinc, nickel, copper, mercury, and lead ions at concentrations of 2 or 3 ppm; cetyl pyridinium chloride at 1 ppm; aniline at 30 ppm; and other compounds in a similar concentration range. The sensitivity to zinc ions was comparable to that of monitoring systems using fish. Combinations of metals were effective when each was present at a level lower than its minimum effective concentration when used alone. The response, which is visible by darkfield microscopy, is an immediate cessation of bacterial motility due to uncoordination of the flagella. The method was developed for in-plant use in testing effluents for uncoordinating concentrations of toxic agents before discharge into a stream. W75-00699

PREDICTION OF EFFLUENT MIXING PAT-TERNS USING A BACTERIOPHAGE TRACER, University Coll., Cardiff (England). Dept. of Microbiology. M. Statham

Water and Waste Treatment, Vol 17, No 3, p 20, 22, 24, March, 1974. 5 fig, 3 ref.

Descriptors: *Mixing, *Tracers, *Bacteriophage, Water circulation, Discharge(Water), Suspended solids, Hydrogen ion concentration, Volume, *Pollutant identification, *Path of pollutants.

To investigate mixing patterns in water it is necessary to resort to some tracing technique. The technique chosen will depend upon the following factors: volume of water to be labelled, composition and concentrations of dissolved solids in the water, quality and quantity of suspended solids in the water, subsequent use to which labelled water may be put, and information required from the experiment. The use of bacteriophage as a water tracer is a reliable technique. The use of a bacteriophage marker to trace water movement in a fairly turbid estuary is examined. (Sandoski-FIRL) W75-00712 THE DETERMINATION OF FORMALDEHYDE AND RELATED COMPOUNDS IN WATER AND INDUSTRIAL EFFLUENTS,
Canada Centre for Inland Waters, Burlington

(Ontario).

B. K. Afghan, A. V. Kulkarni, R. Leung, and J. F. Environmental Letters, Vol 7, No 1, p 53-65, 1974.

Descriptors: *Analytical techniques, *Water analysis, *Industrial wastes, Automation, Colorimetry, Fluorometry, Surveys, Potable water, *Pollutant identification, *Organic wastes. Identifiers: *Formaldehyde, Carbonyl com-

The automation of colorimetric and fluorometric methods for the determination of low levels of formaldehyde and related compounds in drinking water, natural water, and industrial effluents is described. The colorimetric method utilizes chromotrophic acid; the fluorometric method is based on the reaction of formaldehyde with 2,4pentanedione and ammonia to form a fluorescent product. The fluorometric method was much more specific than the colorimetric procedure and both methods are capable of determining formaldehyde down to 10 micrograms/liter at a rate of 10 to 20 samples per hour. A preliminary survey concerning the occurrence of formaldehyde and related compounds in a wide variety of samples, ranging from drinking waters to industrial effluents was conducted. Results indicate that considerable quantities of these compounds are present in some waters receiving industrial wastes. These results also show that samples which contain formal-dehyde indicate the presence of other carbonyl compounds. (Sandoski-FIRL) W75-00713

CORRELATION BETWEEN BIOCHEMICAL CORRELATION BETWEEN BIOCHEMICAL OXYGEN DEMAND (BOD) AND CHEMICAL OXYGEN DEMAND OF POTASSIUM DICHROMATE (CODCR) IN THE WASTE WATER FROM BOILED NOODLE (SPAGHETTI AND JAPANESE NOODLE), (IN JAPANESE), K. Kadooka, M. Ohata, M. Tsukamoto, and R. Ustasii

Hattori

Journal of Food Science and Technology, Vol 20, No 9, p 426-428, September, 1973. English summa-

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Industrial wastes, Waste water, Potassium compounds, Least squares method, Correlation analysis, Calculaitions, Measurement.
Identifiers: *Boiled noodle plant, *Potassium dichromate, *Japan.

A method of calculating BOD from CODer was determined because the regulation for the waste water from a boiled noodle plant is generally restricted by BOD whose measurement is more complicated and lengthy. The BOD value of the waste water from boiled noodle was highly corwaste water from boiled noodle was highly correlative with CODer value and the equation obtained by a least squares method is BOD = 0.630 times CODer + 43. The correlation coefficient is 0.99 and it is significant at the one percent level of confidence. (Prague-FIRL) W75-00724

SOUND STANDARDS FOR ENVIRONMENTAL IMPROVEMENT,

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-00725

QUATERNARY SYSTEM UREA, AMMONIUM NITRATE AND MONOAMMONIUM NITRATE AND MONOAMMON PHOSPHATE AT 25 C, For primary bibliographic entry see Field 5B. W75-00760

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES, Illinois State Water Survey, Urbana.

W. H. Walker.

Pollution Engineering, Vol 6, No 9, p 50-53, September 1974. 3 fig.

Descriptors: *Pollutant identification, *Soil contamination, *Water pollution sources, tamination, *Water pollution sources,
*Monitoring, *Soil analysis, Soil chemical proper-Holinoling, Son analysis, Son terms properly ties, Path of pollutants, Water pollution sources, Groundwater, Water quality, Sampling, Data collections, Waste disposal, Landfills, Toxins, Chemicals, Soil contamination effects, Soil water, *Path of pollutants.

An effective monitoring system for toxic waste disposal areas should provide an evaluation of immediate and long-term pollution effects. Total pollutant volumes retained and dissipated by at-mospheric dissipation, plant uptake, soil retention, overland runoff, and groundwater should be evaluated. Recent studies show that chemical analysis of core samples from the underlying earth material profile permits a positive definition of any chemical constituents within the profile at any given location. Use of this sampling technique permits a fast, easy, and relatively economical method for detecting soil and groundwater pollution. A minimum of 9 and no more than 25 core test stations should be established on every parcel of land receiving hazardous waste materials. (Gibb-ISWS) W75-00764

WATER QUALITY CRITERIA. For primary bibliographic entry see Field 5G. W75-00937

WATER QUALITY STANDARDS. For primary bibliographic entry see Field 5G. W75-00938

INSTRUMENTAL ANALYSIS IN ENVIRON-MENTAL CHEMISTRY-LIQUID AND SOLID PHASE DETECTION SYSTEMS, Michigan Univ., Ann Arbor. Dept. of Chemistry. D. H. Stedman, and P. A. Meyers.

BioScience, Vol 24, No 6, p 346-349, June, 1974. 5

Descriptors: *Analytical techniques, *Reviews, Chromatography, Infrared radiation, Ultraviolet radiation, Nuclear magnetic resonance, Electrochemistry, Electronics, Neutron activation analysis, X-ray fluorescence, *Pollutant identifi-

Analytical methods which depend upon detection in the liquid or solid phase are described. Methods which analyze solids or liquids after vaporizing them, such as gas chromatography and mass spec-trometry, are not included. The object of this review is to present general capacities of methods such as liquid chromatography, infrared analysis, ultraviolet and visible analysis, electron spin resonance, nuclear mangetic resonance, electroanalytical techniques, and neutron activation and x-ray fluorescence. (Sandoski-FIRL)

ASBESTIFORM AMPHIBOLE MINERALS: DE-TECTION AND MEASUREMENT OF HIGH CONCENTRATIONS IN MUNICIPAL WATER

SUPPLIES, National Water Quality Lab., Duluth, Minn. P. M. Cook, G. E. Glass, and J. H. Tucker. Science, Vol 185, No 4154, p 853-855, September 6, 1974. 2 fig, 18 ref.

Descriptors: "Asbestos, "Silicates, "Water supply, "Municipal water, "Pollutant identifica-tion, Water quality, Water analysis, Industrial wastes, Mine wastes, Water pollution, Water chemistry, "Potable water, Lakes, Electron

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microscopy, X-ray diffraction, Lake Superior, Bottom sediments, Public health, *Minnesota. Identifiers: *Asbestiform, Health problems, Drinking water supplies, *Carcinogenicity, *Duluth(Minn), Taconite tailings, Asbestos minerals, Asbestos-cement pipe, Hydrated silicates. Cancer.

Asbestiform amphibole minerals, which have been demonstrated to be associated with human health problems, were detected in substantial quantities in municipal water supplies taken from western Lake Superior water. The total concentration of amphibole minerals in the Duluth, Minnesota, water supply, as measured by x-ray diffraction for daily samples of suspended solids, averages 0.19 milligram per liter with large fluctuations due to seasonal and climatological effects on lake circulation. Electron microscopic examination of these water samples confirmed the presence of asbestiform amphibole fibers. A conservative estimate of the fiber count for 1973 Duluth water supply samples is (1 to 30) times 1,000,000 amphibole fibers identifiable by electron diffraction per liter of water with a mass concentration of 1 to 30 micrograms per liter. (See also W73-14345 and W75-01000) (Henley-ISWS) W75-00999

ONTARIO INTENSIFIES SEARCH FOR ASBESTOS IN DRINKING WATER,

Ontario Ministry of the Environment, Toronto. Sanitary Engineering Branch.

Water and Pollution Control, Vol 111, No 9, p 33-35, September 1973. 3 fig, 4 tab.

Descriptors: *Asbestos, *Pollutant identification, *Water analysis, Potable water, *Electron microscopy, Analytical techniques, *Canada, Municipal water, Water supply, Water pollution sources, Great Lakes, Cities.
Identifiers: *Ontario(Canada).

In August 1972 the Ontario Ministry of the Environment had 22 samples of municipal potable water analyzed for asbestos by electron microscope. All contained the substance, but none of the levels are considered a health hazard. Samples were examined at a direct screen magnification of 25,000 times, at an accelerating voltage of 80 KV. Identification of chrysotile asbestos fibres was relatively simple due to their characteristic tubular appearance and equally characteristic electron diffraction pattern. Data present asbestos fibre count in millions per litre and estimated mass concentration in micrograms per liter. Distribution of fibres as to size was also calculated for each sample. There is some evidence that complete treatment filtration can reduce the concentrations of asbestiform fibres in water. (See also W74-14345 and W75-00999) W75-01000

DOWN-HOLE EH-PH PROBE AND WATER

Commonwealth Scientific and Industrial Research Organization, Floreat Park (Australia). Div. of Mineralogy. For primary bibliographic entry see Field 7B.

W75-01016

A NUMERICAL STUDY OF THE CONCENTRA-TION OF SOME HEAVY METALS IN TASMANIAN OYSTERS, Commonwealth Scientific and Industrial Research

Organization, Hobart (Australia). Tasmanian Regional Lab. For primary bibliographic entry see Field 5C.

W75-01020

VARIATIONS IN THE ZINC, COPPER, MAN-GANESE AND LEAD CONTENT OF BALANUS BALANOIDES IN CARDIGAN BAY, WALES, University Coll. of Wales, Aberystwyth. Dept. of For primary bibliographic entry see Field 5C.

AUTOMATED COLORIMETRIC METHOD FOR TOTAL CYANIDE IN WATER AND WASTE-

Illinois State Environmental Protection Agency, Champaign. Div. of Lab. Services. J. L. Royer, J. E. Twichell, and S. M. Muir. Anal Lett. Vol 6, No 7, p 619-627. 1973. Illus. Identifiers: Automated methods, Benzidine, Bromides, *Colorimetric method, Cyanogen, Method, Pyridine, Waste waters, *Pollutant identification, Iron compounds.

An automated benzidine-pyridine method for the analysis of total Cn is described. Cn is converted to CnBr by the reaction with Br water. CnBr reacts with benzidine in a dilute pyridine medium to form an intense red color directly proportional to the Cn concentration. Cn often is found complexed with metals. Complex Fe cyanides such as ferrocyanide or ferricyanide are difficult to decompose, but the conversion is hastened with HgCl2 and MgCl2 in a modified Serfass distillation. HCn is readily formed and absorbed in NaOH.--Copyright 1974, Biological Abstracts, Inc. W75-01060

ON THE PHENOMENON OF DESORPTION AT THE AIR/WATER INTERFACE, Florence Univ. (Italy). Dept. of Physical Chemis-

R. Cini, G. Loglio, and A. Ficalbi. Ann Chim. Vol 62, No 11/12, p 789-796. 1972. Illus. Identifiers: *Air-water interface, Alcohols, *Desorption, Diffusion, Phosphine, Pollution, Surfaces, Organic compounds, Aqueous solu-tions, Nitrogen, *Pollutant identification.

The surface pressure variation micro as a function of time, after a rapid surface area decrease, was measured by the Wilhelmy plate method for aqueous surfactant solutions. The method and the procedure used were suitable for obtaining meaningful quantitative results in desorption kinetic studies for surfactants requiring long times for the attainment of surface equilibrium, when their concentrations are of the order of 1 ppm or lower. The mathematical treatment developed by Ward and Tordai for diffusion from bulk liquid to surface (adsorption case) was extended to desorption and an equation for the latter case was The experimental data, relative to dimethyldodecylphosphine oxide and n-decyl alcohol, were in agreement with the values calculated with this equation. For these compounds the desorption process is controlled by diffusion. Practical applications of dynamic surface pressure studies in pollution problems are suggested.--Copyright 1974, Biological Abstracts, Inc. W75-01069

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STOCHASTIC MODEL FOR A DYNAMIC ECOSYSTEM, Virginia Polytechnic Inst. and State Univ.,

Blacksburg Dept. of Statistics. W. R. Schofield, and R. G. Krutchkoff.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 933, \$5.75 in paper copy, \$2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin No 60, (VPI-WRRC-BULL 60), (1973). 149 p, 13 fig, 3 tab, 40 ref, 2 append. OWRT A-999-VA(16).

Descriptors: *Model studies, *Stochastic process, *Ecosystems, *Estuaries, *Ecological distribution, Water pollution control, Path of pollutants, Optimization, Mathematical models, Biochemical oxygen demand, Oxygen demand.
Identifiers: *Stochastic models, *Deterministic

The objective is to develop and verify, with actual data, a stochastic model of a dynamic (non-steady state) ecosystem in a one-dimensional, eutrophic (pollution-enriched) estuary, that is, a quantitative relationship will be established between the causes (pollution discharge into an estuary) and the resulting effects (the wholesale degradation of the ecological environment). This cause-effect rela-tionship will include a random component which accounts for the stochastic nature of the process. A one-dimensional model has been developed which is more general and realistic than any previous estuary model--deterministic or stochastic. Generalizations have been made in the differential equations which were solved; in the initial and oundary conditions used; in the manner in which the physical conditions of cross-sectional areas, light intensities, freshwater flow rate, land runoff and benthal demand, water temperature, depth, and turbidity were handled; in the number of components considered; and in the use of time-and position-variable parameters. A very important consideration of this model is that it is approxi-mately twice as fast as the much simpler BOD-OD model. The Orlob model probably describes the estuary hydraulics more accurately than does this model, and it has been extended to two dimensions, but it is restricted to fixed freshwater flow rates, and tidal conditions and to the Thomann type assumptions. The model has been verified to an extent to justify use for the Potomac and other estuaries by field personnel. W75-00559

DEVELOPMENT OF A FLOOD AND POLLU-TION CONTROL PLAN FOR THE CHICAGO-LAND AREA, COMPUTER SIMULATION PRO-

Chicago Dept. of Public Works, Ill. Bureau of En-

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PB-236 645, \$6.75 in paper copy, \$2.25 in microfiche. Technical Report Part 2, December, 1972, 101 p. 37 fig.

Descriptors: *Systems analysis, *Simulation analysis, *Pollution abatement, *Channels, Channel improvement, Mathematical studies, Model studies, Simulated rainfall, Illinois, Quality control, Water pollution control, Pollutants, Water pollution, Water pollution effects, Water pollution treatment, Path of pollutants, Tunnels, Drainage systems, Subsurface drainage, Urban drainage, Backwater, Water conveyance, Washouts. Identifiers: *Chicago(Illinois), Chicagoland(Illinois), Waterways, Chicago Drainage Plan, Flood and Pollution Control Plan, Storm management model. Runoff simulation model.

Several computer simulation models developed in the 1960's to solve waterway flooding and pollu-tion problems caused by sewer overflows in the Chicago Metropolitan Area are described. The criteria was established that the most critical storm period or combination of storm and ground moisture conditions should not produce backflow to Lake Michigan when applied to ultimate land and sewer development in the tributary combined sewer area. In order to determine storage reservoir requirements, conveyance tunnel capacity, necessary water improvements, and waterway quality, 32 computer simulation models were developed. One model, the Chicago 'Runoff Simulation Model,' was developed to take hourly rainfall records and simulate the continuous runoff and sanitary flows throughout the year, along with the continuous pollution loads being discharged from each of the drainage areas. Other computer models combine drainage areas in any order of sequence,

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analyze in detail separate storm periods, route flows through detention tanks, determine future flows to treatment facilities, and evaluate the distribution of flows with various system layouts of conveyance tunnels and storage facilities. (Grden-North Carolina)

WATER QUALITY AFTER CLEARCUTTING A SMALL WATERSHED IN WEST VIRGINIA, Forest Service (USDA), Parsons, W. Va. Timber and Watershed Lab. For primary bibliographic entry see Field 4C. W75-00580

OBSERVATIONS OF WATER, AIR AND SOIL POLLUTION IN ISRAEL AND VICINITY FROM THE ERTS-L IMAGERY, Tel-Aviv Univ. (Israel). Dept. of Environmental

Sciences.

For primary bibliographic entry see Field 5A.

DIGITAL COMPUTER SIMULATION THERMAL EFFLUENT DISPERSION RIVERS, LAKES, AND ESTUARIES,

Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Alabama. R. B. Codell.

Available from NTIS, Springfield, Va., 22161, as AD-771 940, \$7.50 in paper copy, \$2.25 in microfiche. Technical Report RS-73-16, November 5, 1973. 227 p, 74 fig, 3 tab, 34 ref.

Descriptors: *Path of pollutants, *Thermal pollution, *Simulation analysis, Numerical analysis, Finite element analysis, Mathematical models, Mixing, Stratified flow, Thermal stratification, Rivers, Lakes, Estuaries.

The dispersion of effluent from thermal powerplants discharging into bodies of water was realistically simulated on a digital computer. The basic equations for the conservation of mass, momentum, and thermal energy in three dimensions were simplified and vertically integrated into dif-ferent forms depending on whether the discharge was of the thermally stratified or well mixed type. Numerical algorithms were devised to solve the finite difference representations of the simplified conservation equations. Extensive linear stability analysis assured the validity and stability of the numerical solutions. The stratified flow model assumes two distinct layers, an upper thermal layer and a lower ambient layer either stagnant or flowing. The nonstratified model is useful for cases of large bodies of water where there is severe mixing and no appreciable stratification. In both models, the boundaries of the computational grid are completely general and are able to simulate arbitrary shorelines and discharge configurations. (Knapp-USGS) W75-00622

SELENIUM IN THE WATER RESOURCES OF NEBRASKA IN COMPARISON TO PUBLIC HEALTH STANDARDS.

Geological Survey, Lincoln, Nebr. R. A. Engberg.

In: Short Papers of the Eighth American Water Resources Conference, St. Louis, Missouri, Oc-tober 30-November 2, 1972: American Water Resources Association Proceedings Series No 16, p 1-2, 1972. 1 tab.

Descriptors: *Water chemistry, *Water quality standards, *Nebraska, *Poisons, *Public health, Sampling, Data collections, Groundwater, Surface Identifiers: *Selenium.

Selenium concentrations were determined for several water samples from Boyd County, Nebraska, where Cretaceous formations known to

contain selenium crop out and form the parent material for soils. Water from one well contained 420 micrograms/liter of selenium. The highest detected concentration was 460 micrograms per liter. Water from over one-third of the wells sampled on a statewide basis and from over one-fourth of the surface-water locations contain selenium in concentrations greater than the limit established by the U. S. Public Health Service for drinking water. (Knapp-USGS) W75-00637

WATER QUALITY MONITORING, National Ocean Survey, Rockville, Md. For primary bibliographic entry see Field 5A.

FIELD MEASUREMENTS REQUIRED FOR VERIFICATION OF POLLUTION DISPERSION COMPUTATIONS WITH HYDRODYNAMICAL-NUMERICAL MODELS,

Environmental Prediction Research Facility (Navy), Monterey, Calif.

G. D. Hamilton, and T. Laevastu.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 100-121, 1972. 17 fig, 13 ref.

Descriptors: *Path of pollutants, *Mathematical models, *Dispersion, Numerical analysis, Hydrodynamics, Estuaries, Coasts, Bays, Har-

Hydrodynamical-numerical (HN) reproduce currents and water level in short time steps at desired predesignated grid points. Thus, these models are ideally suited for investigating the fate of pollution introduced at any location within a defined water area. The diffusion and dispersion formulas included in HN models consist of two separate parts; on e for diffusion and the other for advection. Bottom friction and horizontal viscosity coefficients must be known in narrow bays and estuaries. After tidal data, winds, and any freshwater inflow are properly in-troduced, correct flushing computations can then be made. Verification can be done with the results of dye experiments. The dispersion formulas also include decay constants. (See also W75-00644) (Knapp-USGS) W75-00660

WATER POLLUTION, SHIPS' WASTE-WATERS, WATER QUALITY MEASUREMENT, Naval Ship Research and Development Center, Annapolis, Md. W. Van Hees.

In: Proceedings of Naval Environmental Protec-tion Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 122-126, 1972. 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Data collections, *Sampling, *Pollutant identification, *Ships, Chemical oxygen demand, Waste water treatment, Biochemical oxygen demand, Water pollution control.

Data needed for use in shipboard treatment plant control, or for effluent quality monitoring are discussed. The determination of the chemical oxygen demand, when ships' wastewaters are being studied, should yield data that will be more re peatable than and as useful as conventional BOD data. The bulk of the polluting matter in the shipboard waste streams is organic; it almost completely stems from hotel services and is essen-tially wholly biodegradable. Generation of wastewater containing heavy metals can be controlled; the quantities involved can be contained for treatment and disposal ashore. (See also W75-00644) (Knapp-USGS) W75-00661 AERIAL COASTAL OCEANOGRAPHY AND POLLUTION SURVEILLANCE, Naval Underwater Systems Center, New London, For primary bibliographic entry see Field 5A. W75-00663

A SYSTEMATICAL AND ECOLOGICAL STUDY OF THE DIATOM FLORA OF LESOTHO WITH SPECIAL REFERENCE TO THE WATER QUALITY, National Inst. for Water Research, Pretoria (South

Africa). For primary bibliographic entry see Field 5C. W75-00666

THE INTRUSION OF LOGGING DEBRIS INTO ARTIFICIAL GRAVEL STREAMBEDS, Oregon State Univ., Corvallis. Water Resources Research Inst.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 072, \$4.75 in paper copy, \$2.25 in microfiche. Completion Report No WRRI-27, September 1974. 79 p, 12 fig. 9 tab, 54 ref, 2 append. OWRT A-019-ORE(1).

Descriptors: Sediments, Bed load, Suspended load, *Low flows, *High flows, Lumbering, Interception, Statistical methods, Sediment *Streambeds, Gravel, *Regression analysis. *Organic matter.

Identifiers: Gravity settling, Sieving, Organic sedi-

The objective was to describe quantitatively the intrusion of logging debris into artificial gravel streambeds during conditions of low stream flow with a stable streambed, and begin an analysis of the effect of high flow and unstable streambeds. Prior studies indicated that logging debris was responsible for dissolved oxygen reduction within the gravel bed of spawning streams. Low flow-stable streambed studies were conducted for eighteen to twenty days in a flume. Two high flow studies were also conducted. Samples were subdivided vertically into three sections and analyzed for pore volume, solid volume, and organic material present. Quantitative changes in organic material in each section of a sample were determined. These changes were compared with the depth of the sample, organic size class, position of the sample horizontally from a datum point, time, porosity, solid and pore volume, and rainfall during sampling days. Significant variables influencing intrusion were found by multiple regression analysis. The best predictive equation had a multiple cor-relation coefficient of .1879. The range of debris concentrations of the two deeper sections for both low flow studies were .07 gm/l and .15 gm/l respectively. The average concentration values for both low flow studies were .03 gm/l and .02 gm/l respectively. No variables in the high flow study were found to be good predictors of intrusion. The range of concentrations of the two high flow stu-dies were .14 gm/l and .04 gm/l respectively. W75-00695

BENTHAL SULFIDE RELEASE IN AQUATIC

Oregon State Univ., Corvallis. Department of Civil Engineering.

D. A. Bella. Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 074, \$3.25 in paper copy, \$2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion report, (1974). 16 p, 6 fig, 23 ref. OWRR A-011-ORE(2).

Descriptors: *Sulfides, *Benthos, Aerobic condi-tions, *Hydrogen sulfide, Toxicity, Aquatic life, Oxygen demand, Dissolved oxygen, Air pollution, Water pollution sources, Water pollution effects. Identifiers: *Free sulfides.

Group 5B-Sources Of Pollution

The purpose was to better understand benthic systems with emphasis on the release of free sulfides from the systems. High concentrations of free sulfides within the deposits and the release of free sulfides to the overlying water and atmosphere can be environmentally significant because: (1) Free sulfides, particularly hydrogen sulfide, are toxic at low concentrations to fish, crustaceans, polychetes, and a variety of benthic microinvertebrates. (2) The release of free sulfides can increase the benthic oxygen demand rate and thus lead to a decline in the aerobic zone of the deposit and a lowering of the DO concentrations within the overlying waters, particularly with the interfacial regions. (3) The release of hydrogen sulfide to the atmosphere can cause an air pollution problem. W75-00696

AN INVESTIGATION OF THE RETURN FLOW

FROM IRRIGATED LAND, Texas A and M Univ., College Station. Water Resources Inst.

K. W. Brown, C. J. Gerard, D. W. DeMichele, P. J. H. Sharpe, and B. W. Hipp.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 073, \$13.25 in paper copy; \$2.25 in microfiche. Technical Report No 60, September 1, 1974. 541 p, 4 append. OWRT B-148-TEX(1). 14-31-001-3940.

Descriptors: *Return flow, *Irrigated land, *Texas, *Model studies, *On-site investigations, Irrigation water, Water quality, *Leaching, *Root zone, *Lysimeters, Sorghum, Fertilizers, Nitrogen, Saline water, Soil treatment, Ion exchange, Soil moisture, Salt balance, Oxygen, *Path of pollutants, Absorption, Soil-water-plant relationships, Computer programs. Identifiers: *Rio Grande Valley(Tex).

This project included a field study and a modeling effort, both directed at elucidating the influence of irrigation water quality on the quantity and quality of irrigation return flow by leaching below the root zone. The field work consisted of the installation of six large buried monolith lysimeters equipped with appropriate drainage devices. Suction water samples were collected for 8 months including the cropping season. The sorghum crop grown on paired lysimeters was irrigated with a high salt and low salt water and was fertilized with different levels of nitrogen. Although care was taken to secure lysimeters with similar soil, large differences between the volume of leachate and the concentration of ions in the leachate were found. During the period the measurements were made, the changes in concentration of leachate were not attributable to the treatments applied. The modeling effort was directed toward assembling and testing the following components of an overall water-salt-nutrients balance model: (a) Water and heat flow model to calculate the influence of moisture and temperature gradients on the movement of water between the source(s) and sinks within the system, (b) An ion exchange equilibrium model to calculate the salt balance, (c) A nitrogen model to calculate complex nitrogen transfers which take place within the soil, and (d) A root oxygen supply model to calculate the sink strength for oxygen and ultimately the distribution of root water uptake within the soil profile. These components of the overall model have been programmed, tested, documented, and are presented. W75-00698

PREDICTION OF EFFLUENT MIXING PAT-TERNS USING A BACTERIOPHAGE TRACER, University Coll., Cardiff (England). Dept. of Microbiology.

For primary bibliographic entry see Field 5A.

For primary W75-00712

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND PART III--NUTRIENT TRANSPORT THROUGH THE SAND, Rensselaer Polytechnic Inst. Troy, N.Y

D. B. Aulenbach, J. J. Ferris, N. L. Clesceri, and T. J. Tofflemire.

Ground Water, Vol 12, No 5, p 301-309, September-October 1974. 12 fig, 2 tab, 3 ref.

Descriptors: *Groundwater movement, *Seepage,

"Waste water disposal, Recharge, "New York, Sands, Sewage effluents, Dissolved solids, Chemical analysis, Wells, Water quality, Groundwater, Nitrogen, Nitrates, Chlorides, Phosphates, Alkalinity, Measurement, On-site investigations, Water pollution, Pollutant identification, Dissolved everyteen. solved oxygen.

Identifiers: *Lake George Village(NY), West Brook(NY).

A study was made of groundwater quality of wells placed in and near sand beds receiving treated municipal sewage effluent. Wells were placed in the sand beds and between the beds and a stream receiving the bed seepage. Measurement of the quality of the groundwater in these wells indicated that soluble phosphorus was effectively removed in passing through approximately 2000 ft of sand, chlorides were essentially unchanged, and organic and ammonia nitrogen were oxidized to nitrate, which was highly mobile. One set of samples from sewage treatment plant influent and effluent, from the receiving stream and from several wells, was assayed for the presence of coliphage. Comparisons of receiving stream samples tanken up-stream and downstream from the sand bed seepage indicated increased alkalinity, dissolved solids, nitrate, and chloride at the downstream lo-cation. (See also W74-09095) (Harmeson-ISWS)

QUATERNARY SYSTEM UREA, AMMONIUM NITRATE AND MONOAMMONIUM PHOSPHATE AT 25 C.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as TT-73-55007, \$4.00 in paper copy, \$2.25 in microfiche. National Science Foundation Technical Translation-55007, 11 p, 1973. 8 fig, 3 tab, 13 ref. Translated from Nauchnyi Institut po Udobreniyam i Insektofungitsidam, No 208, p 7-16, 1965.

Descriptors: *Fertilizers, *Solubility, *Saturation, Physical properties, *Ureas, Nitrogen compounds, Organic compounds, Ammonium salts, Aqueous solutions, Chemical precipitation, Analytical techniques, Water chemistry, Supersaturation, Crystallography, Crystal growth, *Phosphates, Isotherms, Crystallization, X-rays, *Ammonium compounds, *Nitrates. Identifiers: Isothermal method.

A study was presented of the mutual solubility of ammonium nitrate, urea, and monoammonium phosphate in water. The 25C solubility isotherms of the ternary system CO(NH)2 - NH4PO3 - H2O and of the quaternary system CO(NH)2 - NH4H2PO4 - NH4NO3 - H2O were investigated. At 25C in both the ternary and quaternary systems urea, ammonium phosphate, and ammonium nitrate were released into the solid phase. In the nutate were released into the solid phase. In the solid phases compound formation was absent. The composition of the eutectic of the quaternary system was determined at 25°C with the following results: 40.7% urea, 49.03% ammonium nitrate, 0.78% monoammonium phosphate, and 10.12% water. (Henley-ISWS)

FACTORS AFFECTING LONGITUDINAL WATER TEMPERATURE DISTRIBUTION DOWNSTREAM FROM A POWER STATION, C. G. Amato.

Nordic Hydrology, Vol 5, No 2, p 77-97, 1974. 2 fig, 4 tab, 10 ref.

Descriptors: *Thermal pollution, *Heated water, *Nuclear powerplants, Fossil fuels, *New Jersey, Powerplants, Cooling towers, Cooling water, Cost comparisons, Byproducts, Electric powerplants, Comparisons, Electric power production, Heat, Heat transfer, Nuclear engineering, Thermodynamics, Environmental effects, Downstream, *Path of pollutants, *Water temperature, *Distribution patterns. Identifiers: Rankine cycle, Reject heat, Brayton cycle, Carnot cycle.

The magnitude of reject heat from fossil fuel and nuclear power plants, the distances to which sensi-ble heat effects may be experienced in a receiving stream, and alternate means of rejecting heat were discussed. Cooling towers were discussed and calculations presented to show cost and by-products produced by a fossil fuel plant operation. Opera-tional data from 14 fossil fuel plants and 1 nuclear plant were presented. These data show that an older fossil plant may reject as much heat on a normalized basis to water as a reactor even though the fossil plant is of lower capacity. (Terstriep-ISWS) W75-00762

EXPERIMENTAL STUDY ON THE NITROGEN CIRCULATION OF A BIOLOGICAL POND, Helsinki City Waterworks (Finland). For primary bibliographic entry see Field 5D. W75-00763

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES, Illinois State Water Survey, Urbana

For primary bibliographic entry see Field 5A.

ORTHOPHOSPHATE IN GROUND WATER, HALL COUNTY, NEBRASKA,
Nebraska State Dept. of Environmental Control,
Lincoln. Water Pollution Control Div. J. C. Atkinson. Ground Water, Vol 12, No 5, p 291-295, September-October 1974. 2 fig, 7 ref.

Descriptors: *Phosphates, *Aquifers, *Land use, *Nebraska, Groundwater, Water quality, Geology, Hydrology, Soil types, Sewage effluents, Water table, Seepage, Sampling, On-site data col-lections, Fertilizers, Water pollution sources, Cul-tivated lands, Water supply, Path of pollutants. Identifiers: Hall County(Neb), Platte River(Neb).

Orthophosphate concentrations were determined for samples taken from 161 wells, and for 8 stream samples from the Platte River, all located in Hall County, Nebraska. Areal differences in concentration were correlated with geology, hydrology, soil types, land use, and possible sources of phosphate in water. In the groundwater, the orthophosphate concentrations ranged from 0 to 1.7 milligrams per liter. About 50% of the county's groundwater contains concentrations of 0.1 milligrams per liter, or greater. In two areas aggregating 115 square miles (about 20% of the county area), orthophosphate concentrations exceeded 0.5 milligrams per The reasons for high concentrations include: moderate to high soil fertility and permeability, relatively shallow water table, and seepage of municipal sewage effluent. Concentrations ranged from 1.0 to 1.7 milligrams per liter in the sparsely populated northern sand hills region. (Harmeson-ISWS) W75-00779

MICROBIOLOGICAL PROCESSES OF THE PRODUCTION OF HYDROGEN SULFIDE IN THE REPNOE LAKE (SLAVIC LAKES), (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms. For primary bibliographic entry see Field 5C.

Sources Of Pollution—Group 5B

SUPERSATURATION IN THE AQUEOUS SYSTEMS NH4H2PO4 - NH4NO3 - KCL AND NH4H2PO4 - NH4NO3 - CO(NH2)2,

Leningrad Lensoviet Technological Inst. (USSR). M. E. Pozin, B. A. Kopylev, and N. K. Shilling. Available from the National Technical Information Service, Springfield, Va 22161 as TT-73non Service, Springileta, Va 22101 as TT-73-55006, \$4.00 in paper copy, \$2.25 in microfiche. National Science Foundation Technical Transla-tion TT-73-55006, 10 p, 1973, 4 fig, 2 tab, 7 ref. Translated from Izvestiya Vysshikh Uchebnykh Zavedenii Khimiya i Khimicheskaya Tekh, Vol 8, No 6, p 883-888, 1965.

Descriptors: *Fertilizers, *Solubility, *Chemical precipitation, *Agricultural chemicals, *Aqueous solutions, *Ammonium compounds, Nitrates, Phosphates, Ureas, Saturation, Phosphorus compounds, Ammonium salts, Organic compounds, Analytical techniques, Nutrient requirements, Nitrogen compounds, Potassium compounds, Su-

persaturation.
Identifiers: Carbamide, Polythermic method,
Polythermal profile.

A major requirement for liquid compound fertilizers is the high solubility of their component sub-stances at relatively low temperatures. Results were presented of a study to examine supersaturation in two systems containing compounds nor-mally used for fertilizers: (1) ammonium hate, monobasic-ammonium nitrate-potassium chloride-water; and (2) ammonium phosphate, monobasic-ammonium nitrate-carbamide-water. In a temperature range from -10 to 50 C and with weight ratios to NH4H2P04:NH4N03 in the first system equal to 0.5:2.65 and in the second system equal to -0.5:4, the temperatures of supersaturation differ significantly from the temperatures of their saturation. The 15 C isotherm of supersaturated solutions of the first system is displaced relative to the isotherm of its solubility to the area of a higher ratio of monophosphate and ammonium nitrate (from 1 to 2.65 instead of 0.5 to 1.6). The 10 mitrate (from 1 to 2.65 instead of 0.5 to 1.6). The 10 C isotherm of the supersaturated solutions of the second system is displaced relative to the isotherm of its solubility toward a lower content of carba-mide for an average of 10 to 25%. (Henley-ISWS) W75-00794

DEUTERIUM AS A TRACER IN SNOW HYDROLOGY, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 2C. W75-00813

MOVEMENT OF WATER THROUGH SNOW PACK TRACED BY DEUTERIUM AND TRITI-

Iceland Univ. Reykjavik Science Inst. For primary bibliographic entry see Field 2C. W75-00829

THERMAL MODIFICATION OF RIVER ICE COVERS: PROGRESS AND PROBLEMS, Cold Regions Research and Engineering Lab., Hanover, N. H.
W. F. Weeks, and S. L. Dingman.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1427-1435, 1973.

Descriptors: *Ice cover, *Ice, *Rivers, *Thermal ing, Heat balance, Heat budget, Mathematical models. pollution, Water pollution effects, Melting, Freez

Thermal modification of river ice is discussed. In certain locations excess heat could be used to good advantage in removing ice. Current attempts to model winter river temperatures are discussed. For most planning purposes water temperatures may be adequately estimated below thermal pollution sites. In many cases the most important factor in controlling the quality of the estimates is the adequacy of meteorological data. Prediction of the time dependent behavior of the ice cover below artificially induced ice-free reaches is poor. (See also W75-00809) (Knapp-USGS)

U.S. V. MOBIL OIL CORP. (RIVERS AND HAR-BORS ACT VIOLATION).

For primary bibliographic entry see Field 6E. W75-00952

LAND AND WATER POLLUTION FROM RECREATIONAL USE.

National Industrial Pollution Control Council, Washington, D.C. Sub-Council Report, December 1971, 24 p, 4 photo, 1 append.

Descriptors: *Recreation, *Water pollution sources, Land management, Resources development, Water management(Applied), Federal government, State governments.

Recreation can be a source of pollution by both those who participate directly in outdoor recrea-tion and those who provide the products and ser-vices which make recreation available to consumers. These groups and the pollutional problems associated with them are described. , and an attempt is made to minimize their impact upon the percentage of available waters on which they tend to concentrate. While business and industry are prime factors in pollution resulting from outdoor recreation, the role of government as a source of land-use and water pollution in outdoor recreation areas is probably of far greater importance. Government at all levels has established and protected park and recreation areas. However, funding and planning are often inadequate, resulting in such problems as substandard campgrounds, overuse of areas, and inadequate water, sewage and waste disposal systems. (Ritchie-Florida) W75-00954

FLUORIDE VARIATION IN DOMESTIC SEWAGE RELATIVE TO TAP WATER AND PRECIPITATION, Saskatchewan Univ., Saskatoon, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-00965

URBAN RUNOFF QUALITY AND MODELING

Nebraska Univ., Lincoln. Dept. of Civil Engineer-

ing. S. L. Hergert. Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 141, \$6.25 in paper copy, \$2.25 in microfiche. Master's Thesis. December 1972. 141 p, 19 fig, 19 tab, 26 equ, 27 ref, 2 append. OWRT A-025-NEB(1).

Descriptors: *Urban runoff, *Storm runoff, *Water quality control, *Pollutants, *Simulation analysis, *Computer models, *Hydrologic data, Storm water, Organic wastes, Land use, Flow hydrographs, Systems analysis. Identifiers: Inorganic wastes, Concentrations, Receiving stream.

Preliminary studies on urban runoff have disproved theories about the purity of storm runoff.
Urban storm runoff is a possible source of significant amounts of both organic and inorganic waste material. The question arises as to the effect of storm water on a receiving stream alone or in con-junction with other pollutional sources. Presented is a study whose purpose was to obtain data on the pollutant concentration vs duration of runoff, the relationship between concentration and flow, and the effect of land use on the amounts and types of pollutants present in runoff. The study also in-volved preliminary work on the development of a computer model for simulating the effects of urban runoff from various land use areas. Some conclusions reached were: (1) urban storm water may contain significant amounts of pollutants, and on some occasions these concentrations may cause serious degradation of a receiving stream; (2) the 'flush effect' of pollutants at the start of runoff was found to occur in most storms sampled in this study; (3) there are considerable concentrations, at times, of coliforms in urban runoff; (4) differences were found in pollutional loading for three sampling points--land use may prove a good indication of expected pollutional loads; and (5) the computer model was found capable of producing a flow hydrograph which gave results close to those observed in the field. (Bell-Cornell) W75-00972

DETERMINATION OF A NITROGEN-PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA, University of West Florida, Pensacola. Dept. of

Biology. For primary bibliographic entry see Field 5C. W75-00976

MICROORGANISMS CAPABLE OF DEGRAD-ING REFRACTORY HYDROCARBONS IN OHIO WATERS, Dayton Univ., Ohio. Dept. of Biology. For primary bibliographic entry see Field 5C. W75-00977

CONCENTRATIONS OF METAL IONS IN MEL-BOURNE'S RIVERS.

La Trobe Univ., Bundoora (Australia). Dept. of Chemistry.

D. H. Dale, M. Davis, C. T. Hall, and D. Hodgkins. Proceedings of the Royal Australian Chemical Institute, Vol 41, No 10, p 241-244, October 1974. 3 fig, 2 tab, 9 ref.

Descriptors: Water pollution sources, *Metals, *Cities, Pollutants, Cadmium, Chromium, Cobalt, Copper, Heavy metals, Iron, Lead, Manganese, Nickel, Zinc, Calcium, Potassium, Toxicity, *Australia, *Ions, *Path of pollutants. Identifiers: *Melbourne(Vic), Maribyrnong River,

Water samples from 23 locations on the Maribyrnong and Yarra Rivers in the Melbourne metropolitan region, Victoria, Australia, were analysed for concentrations of iron, zinc, cobalt, nickel, manganese, lead, cadmium, calcium, potassium, chromium, and copper. Variations in concentrations by area and over seasons are noted and discussed briefly. Some of the metals - notably zinc and lead - were present in concentrations like-ly to be toxic to fish. The lower regions of both rivers were heavily contaminated; not only is lower Yarra River water unfit to drink, but in cer-tain aspects it would not meet recognized stan-dards for industrial water discharge. (CSIRO) W75-01009

Virginia Mason Research Center, Seattle, Wash. For primary bibliographic entry see Field 5C. W75-01021

SEQUENTIAL TECHNIQUE TO STUDY THE DISTRIBUTIONS OF SOME FISSION NUCLIDES IN THE MARINE ENVIRONMENT, Bhabba Atomic Research Centre, Bombay (India). Health Physics Div. G. R. Doshi, T. M. Krishnamoorthy, V. N. Sastry, and T. P. Sarma.

Arch Oceanogr Limnol, Vol 17, No 3, p 209-222,

Group 5B-Sources Of Pollution

Identifiers: Crabs, Distributions, *Fish, *Fission nuclides, *Marine environment, Mudskipper, Prawns, Shellfish, *Radionuclides, Monitoring,

A sequential scheme is presented to study the distribution of 144Ce, 106Ru, 95Zr, 137Cs and 90Sr in the 3 matrices of marine environment. Preconcentration of 144Ce, 106Ru and 95Zr from 2001 of seawater is made on Mn02 precipitated by the autoreduction of permanganate with MnCl2 leaving 137Cs and 90Sr in the supernatant. 137Cs is collected on ammonium phosphomolybdate. 90Sr is allowed to reach equilibrium with its daughter and 90Y is carried on FeOh3. The same method is employed for the analyses of sediments and biomaterials, with minor modifications. This sequential scheme facilitates monitoring large volumes of seawater and indicator organisms (fish, prawns, mudskippers, crabs, shellfish) for radiation sur-veillance.—Copyright 1974, Biological Abstracts, W75-01030

DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM, Southeast Missouri State Univ., Cape Girardeau.

Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-01081

5C. Effects Of Pollution

ALGOLOGICAL NOTES. 1. STAURASTRUM BRACHIOPROMINENS, ET ALL., Uppsala Univ. (Sweden). Inst. of Plant Ecology.

K. Thomasson.

Revue Algologique, NS, Vol 2, p 122-128. 12 fig, 1

Descriptors: *Algae, *Systematics, Distribution. Identifiers: *Staurastra, Desmids.

taxonomic monograph discusses troublesome species Staurastrum belonging to the Desmidiaceae. The drawings which accompany the descriptions are of the greatest importance and much depends on their exactitude as it is impossible to depict the fine details photographically. The amplitude of variation in different species listed is of great significance. In a table containing measurements of Staurastra, 1 and 2 belong to St. brachioprominens occurring in Australia and Brazil. Three and 4 are for the time being combined under St. brachioprominens var. archerianum which occurs in the Azores. There is good reason to consider 5 to 10 as an independent spe-cies, St. uplandicum, which is found in Finland, Sweden and Denmark. No. 13, St. iversenii, from Denmark leads to the following species viz. the two tropical 11 and 12, which can be united in one species St. guentherii, also from Brazil and from Ceylon. No. 14 is an independent species, St. caledonense, which occurs in Africa. (Jones-Wisconsin) W75-00566

MONOSTROMA GREVILLEI (THURET) WIT-TROCK, A SPRING ALGA ON THE COAST OF

OLAND, Uppsala Univ. (Sweden). Inst. of Plant Ecology. A. Martinsson. Sartryck ur Svensk Botanisk Tidskrift, Vol 49, No

1-2, p 252-258, 1955. 2 fig, 22 ref.

Descriptors: *Algae, *Springs, *Coasts, Ecology, Life history studies.
Identifiers: *Monostroma Grevillei, Baltic.

During spring low-water levels and calm weather, in the vicinity of Oland, Sweden the growth and distribution of the alga Monostroma Grevillei was noted on uneven moraines where it completely

covered many boulders, with the thallus split into narrow lobes. Those individuals growing in less exposed positions were divided less and had broader and longer lobes. In the bays, the algae grew epiphytically on oldish leaves and roots of aquatic plants. M. Grevillei seems to have been an overlooked spring alga in the Baltic due to the fact that its fronds appear only within a period when few algological observations are made. However, it plays a very great part in the algal vegetation close to the shore on the coasts of Oland and should be mentioned in the spring vegetation. Its life history is detailed. From in vitro studies it seems to be probable that M. Grevillei is represented by only a very minute sporophyte dur-ing the greater part of the year, liberating zoo-spores which give rise to a gametophytic generation of large fronds existing only a few months in spring. (Auen-Wisconsin) W75-00567

PLANKTON AND ENVIRONMENT OF NORTH PATAGONIAN LAKES.

Uppsala Univ. (Sweden). Inst. of Plant Ecology. K. Thomasson.

Annales Societatis Tartuensis ad res Naturae Investigandas Constitutae, Ser Nova IV, p 9-28, 1964, 6 fig. 71 ref.

Descriptors: *Aquatic algae, *Lakes, *South America, Chemical properties, Light penetration, Water temperature, Plankton, Primary productivi-ty, Crustaceans, Distribution, Oligotrophy, ty, Crustaceans, Diatoms, Rotifers.

Identifiers: *Patagonia, Chilean lakes, Argentina, Melosira granulata, Fragilaria crotonensis, Dic-tyosphaerium pulchellum, Eudorina elegans, Anabaena solitaria, Tanytarsus, Anaspidacea.

In the Chilean lake district and in the Patagonia territories of Argentina, numerous large lakes are located along the slopes of the Andean chain. Nearly all records are comparable with the values Nearly all records are comparable with the values from Scandinavian oligotrophic lakes, e.g., those reported from the oligotrophic upland lakes in Sweden. The physical characteristics of these lakes are given. The lakes in the Chilean lake district lie at 51-300 m, except the subalpine Lake Quillehue (1196 m), while the Argentinean lakes lie at altitudes of about 600-980 m. All collections are considered as random samples only. Melosira granulata, Fragilaria crotonensis, Dictyosphaerium pulchellum, Endorina elegans, Anabaena solitaris f. planctonica, etc., are locally abundant in the plankton of many lakes; all these algae have been considered as indicating a rather high trophic level when occurring in large amounts. The profundal fauna of the Arauchanian lakes is of the Tanytarsus type and not comparable to north and central european lakes. The common plankter, Fragilaria corotonensis, has an interesting distributional pattern in North Patagonia lakes. From a biogeographical point of view, the discovery of the distom Centronella reicheltii in Lake Villarrica is noteworthy. The algae characterized as endemic are listed. (Jones-Wisconsin) W75-00568

DESMIDS AND OTHER BENTHIC ALGAE OF LAKE KAVSJON AND STORE MOSSE, SW

SWEDEN, Uppsala Univ. (Sweden). T. Flensburg.

Acta Phytogeographica Suecica, Vol 51, 1967. 132 p, 35 fig, 15 tab, 8 plates, 201 ref.

Descriptors: *Systematics, *Benthic *Vegetation, *Aquatic plants, Chemical properrespectation, Aquatic panels, Chemical properties, Lakes, Fen, Chara, Cyanophyta, Rhodophyta, Chlorophyta, Euglenophyta, Chrysophyta, Pyrrophyta, Bogs, Algae, Benthos. Identifiers: *Lake Kavsjon(Sweden), *Store Mosse(Sweden), Desmids.

The benthic algal flora and vegetation in the bog, Store Mosse and Lake Kavsjon in sothern Sweden

are described and listed. The abundance of desmids is particularly noted; out of approximately 400 species and subspecific taxarecorded, 238 were desmids concentrated in the benthos of the lake and adjoining sectors. The desmids typical of shallow Lake Kavsjon include a large number of species of the two large genera Closterium and Cosmarium. The macrophyte vegetation is dominated by Carex rostrata, Equisetum fluviatile and, in deeper portions, Scirpus lacustris, all spe-cies growing in dense stands. Menyanthes trifoliata is locally abundant; Juncus bulbosus and tritolata is locally abundant; Juncus bulbosus and Scorpidium scorpioides is conspicuous in the submersed vegetation. The Big Quagmire (Store Mosse) with the arm stretching out from the lake constitutes a valuable complement to the lake forming an area of rich fen adjoining the lake with graduating vegetational transition. It is evident from the investigation that the dividing line between bog and fen and bog micro-vegetation and between minerotrophy and ombrothrophy is not always accompanied by a very great shift in microflora richness. Possibly the steepest gradient in the influence of the chemical factors is within the group of poor fens and not at the extreme minerotrophy limit. (Auen-Wisconsin) W75-00569

NOTES ON THE VEGETATION OF LAKES IN THE WOODLAND OF LULE LAPPMARK, L. Granmark.

Acta Phytogeographica Suecica, Vol 50, p 228-232, 1967. 3 fig, 24 ref.

Descriptors: *Aquatic plants, *Systematics, *Lakes, Algae, Oligotrophy, Dystrophy, Humus, Floating plants, Pondweeds, Marsh plants, Chemical properties, Physical properties, Cyanophyta, Chlorophyta, Chrysophyta, Zooplankton. Identifiers: *Lue Lappmark, Lake Saggat(Sweden), Lake Satisjaure(Sweden), Monads.

Most of the great lakes of the Lilla Lule river system in northern Lapland are situated in old rift valleys and have great depths to the west but are shallow in the eastern parts. The best examples are the lakes Saggat and Satisjaure. The region's lakes are either clear-oligotrophic and highly transparent or of the dystrophic, humic type, but transitions between the two types are frequent. The only published information available concerns the higher aquatic vegetation. In some humic lakes the vegetation is sparse consisting of Isoetes echinospora, I. lacustris, Ranunculus reptans, Subularia aquatica, Myriophyllum alterniflorum, Utricularia, Hippuris vulgaris and a Nitella species. The floating-leaf plants sometimes grow more densely. Lake Satisjaure contains a sporadic higher aquatic Lake Satisjaure contains a sporagic nigher aquatic vegetation, partly dependent on the occasional shallow bottoms. But on favorable bottom deposits a comparatively rich vegetation of aquatic plants appears. Fairly extensive subaquatic meadows' consisting of various species inhabit the mud bottoms. The boulders and stones on the shores as well as the stems and leaves of aquatic plants are heavily populated by various periphyton, i.e., Cyanophyta, Chlorophyta and Chrysophyta. Large amounts of monads occur at various depths. A listing of plankton gives an ex-ample of the generally common species. (Auen-Wisconsin)

ENVIRONMENTAL INVESTIGATIONS OF DREDGING ACTIVITIES IN MOBILE BAY, **ENVIRONMENTAL**

Technical Committee for Analysis of Mobile Bay

Dredging, Mobile, Ala.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-226 997, \$6.00 paper copy; \$2.25 microfiche. Report July 1973, 57 p. 3 fig, 3 tab.

Descriptors: *Bays, *Environmental effects, *Dredging, Alabama, Shellfish, Water circulation, Sedimentation, Benthic fauna, Navigation, Water

Effects Of Pollution-Group 5C

quality, Channel improvement, Dissolved oxygen, Spoil banks, Management. Identifiers: *Mobile Bay(Ala).

The effects of dredging operations in Mobile Bay are considered. Openwater shell dredging does not create deep channels and associated spoil banks, consequently shell dredging operations do not appreciably affect the overall water circulation patterns. Shell dredging should continue to be supervised with regard to the shoreline, oyster bottoms, and navigation structures. If proper precautions are taken to avoid damage to oyster beds, effects of shell dredging on water quality, substrate, and resident biota are temporary. Channel maintenance dredging is conducted on a frequent, intermittent basis. Except for some physical modifications, water quality and biological effects are generally similar to those for shell dredging. Ap-parent depressed dissolved oxygen conditions prior to construction of the ship channel indicate that the present physical modifications to the bay are not the sole causes of existing water quality conditions. Regarding new channel construction in D'Olive Bay, although sediment (disposed of in a diked land area) exceeded EPA criteria for openwater disposal, hydraulic dredging did not signifi-cantly affect the water quality. The dike failure occurring during the D'Olive Bay study, other dike failures, and management problems point out need for more stringent regulation, inspecttion, and supervision of diked spoil disposal. (Jones-Wisconsin) W75-00571

BIODETERIORATION OF NAVY INSECTI-CIDES IN THE OCEAN, Naval Civil Engineering Lab., Port Hueneme,

H. P. Vind, J. S. Muraoka, and C. W. Mathews. Available from the National Technical Information Service, Springfield, Va 22161 as AD-773 101, \$3.25 in paper copy, \$2.25 in microfiche. Annual Report No 3, December 1973. 14 p, 4 tab, 7 ref. ONR 1-0020.

Descriptors: *Biodegration, *Insecticides, *Oceans, *Wood preservatives(Pesticides), Pesticide toxicity, Sea water, Lipids, Persistence. Identifiers: Limmoria tripunctata.

A two-year test of the persistence and stability were conducted on 20 pesticides, mostly chlorinated insecticides. Matchsticks were first impregnated with solutions of xylene then the impregnated matchsticks were preleached either in the ocean or in hot sea water. Finally, they were exposed in salt water aquaria to attack by wood borers of the species Limmoria tripunctata. Counts were made of the matchsticks which were severed by the borers. The pesticide-impregnated matchsticks which were preleached in the ocean mere less toxic to the borers than were those preleached in hot sea water. The decline in toxicity was greater for wood impregnated with the most fat-soluble insecticide than with the least fat-soluble. It was postulated that the water-insoluble but fat-soluble insecticides were transported from the wood and into the ocean by heat-sensitive microorganisms having lipophilic cell membranes. The concept predicts that insecticides slightly less fat-soluble than DDT will not enter the ocean food chain as readily as DDT. They would not be as hazardous as DDT and yet might be just as toxic and persistent. (Jones-Wisconsin) W75-00572

IMPLEMENTATION OF A PELAGIC ECOSYSTEM MODEL FOR LAKES, Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering. D. Scavia. FWI Report 74-12, July 1974. (IBP Memo Report 74-4). 65 p. 24 fig, 2 tab, 29 ref. T900079.

Descriptors: *Mathematical models, *Lakes, *Ecosystems, *Food chains, Phytoplankton, Zooplankton, Fish, Organic matter, Phosphates, Temperature, Solar radiation, Nitrogen, Nutrients. Identifiers: *Pelagic ecosystem.

A model has been developed to describe the lake pelagic zone. The compartmentalized model includes two size-classes of phytoplankton, two herbivorous zooplankton, omnivorous zooplankton, piscivorous and non-piscivorous fish, particulate and dissolved organic matter, decomposers, and orthophosphates. Forcing functions are water temperature, incident solar radiation, nitrogen con-centration in the water column, and allochthonous inputs. The nutrient limitation construct was described and shown to be more acceptable for natural assemblages than other proposed constructs. The food preference factor of the consumption term was described as a modified Michaelis-Menton relationship, where the curve has been displaced by minimum food level, and the half-saturation 'constant' has become a variable dependent on consumer biomass. The model was evaluated in three domains: process level relationships, rate relationships, and predictive validity. Credibility of the model was increased when five-year simulations proved stable in that three simulations beginning at different initial biomass levels ran to the same steady state values; relationships among the trophic-level compartments fol-lowed ecologic theory; predictions were reasonably accurate for the three zooplankton types and the two phytoplankton size-classes. Perturbation of phosphorous loadings, temperature, and fish stocking gave examples of how the model can be used as a predictive tool. (Jones-Wisconsin)

MICROBIOLOGY AND BIOCHEMISTRY, Max-Planck-Institut fuer Limnologiezu Ploen (West Germany).

Mitteilungen Internationale Vereinigung Limnologie, Vol 20, p 198-228, 1974. 14 fig, 1 tab, 155 ref.

Descriptors: *Microbiology, *Biochemistry, *Mode of action, *Bacteria, Distribution patterns, Ecosystems, Biochemical oxygen demand, Measurement, Photosynthesis, Kinetics, Absorption, Microorganisms, Enzymes, Vitamins, Metabolism.

Identifiers: Heterotrophic production.

The present state of the fundamental difficulties in the study of heterotrophic activities and possible future trends are outlined. Without the knowledge of some metabolic activities and biochemical processes, the heterotrophic portion of the ecosystems, especially the metabolic coupling between autorophic and heterotrophic structures, cannot be understood. Besides morphological peculiarities, photosynthetic bacteria have a particular translation of the processing the process of the pr ticular multilateral metabolism including photoautotrophy, photoassimilation of dissolved organic substrates, and heterotrophy under aerobic and anaerobic conditions. In determination of the biomass for distribution patterns of heterotrophic bacteria, a distinction must be made between the so-called indirect determination of bacteria numers and direct determinations. The function of bacteria in the freshwater ecosystem, oxygen con-sumption, carbon dioxide production, eterotrophic carbon dioxide fixation and uptake kinetics of labeled organic substrates should be measured. The role of microorganisms in cycling of substances, in contrast to the nitrogen fixation of some blue-green algae, the contribution of bac-terial nitrogen fixation for the nitrogen input is relatively unimportant. One of the most interesting groups of dissolved organic substances in the lake ecosystems are the free enzymes. The role of dissolved vitamins for phytoplankton successions is still open to investigation. (Jones-Wisconsin) W75-00575

ALGAL BLOOMS--POSSIBLE EFFECTS OF IRON, WARF Inst., Inc., Madison, Wis.

WARF Inst., Inc., Madison, Wis. S. D. Morton, and T. H. Lee.

Environmental Science and Technology, Vol 8, No 7, p 673-674, 1974. 2 tab, 12 ref. EPA R801168.

Descriptors: *Eutrophication, *Iron, Cyanophyta, Chlorophyta, Manganese, Chlorella, Anabaena, Algal control.

Identifiers: Chlorella pyrenoidosa, Dictyosphaerium pullchellum, Selenastrum capricornutum, Anabaena circinalis, Gloeotrichia echinulata, Microcystis aeruginosa.

To understand the chemical and physical conditions that control dominant algal types, the effects of iron and manganese on green - blue-green mixtures of algae grown in batch cultures were studied. Used were the green algae Chlorella pyre-noidosa, Dictyosphaerium pullchellum, and Selenastrum capricornutum; and the problemcausing blue-green algae Anabaena circinalis, Gloeotrichia echinulata, and Microcystis aeruginosa. Iron, in concentrations of 0.1-1.0 mg/l, caused a shift in dominant types in batch cultures from the relatively unobjectionable greens to the scum-forming blue-greens, without causing a sig-nificant change in the total algal biomass. Results were not dependent on the manganese concentration (0-0.40 mg/l) or the phosphorus concentration (0.07-7.0 mg/l). The mechanism of the stimulation of the blue-greens by iron is not known. It seems unlikely that the iron is tying up the phosphorus, thereby permitting the blue-greens to dominate. Similar results were obtained with no EDTA as for EDTA concentrations of 0.01, 0.10, and 1.0 mg/l which minimizes the possibility that iron may be coagulating some impurity that is toxic to the bluegreens but not to the greens, since EDTA is often used to complex metals that are toxic to blue-green algae. (Jones-Wisconsin) W75-00577

A SOLUTION OF THE INORGANIC CARBON MASS BALANCE EQUATION AND ITS RELATION TO ALGAL GROWTH RATES,

Virginia Univ., Charlottesville. Dept. of Environmental Sciences. M. G. Kelly, M. R. Church, and G. M. Hornberger.

M. G. Kelly, M. R. Church, and G. M. Hornberger. Water Resources Research, Vol 10, No 1, p 493-497, 1974. 2 fig, 1 tab, 18 ref. NSF GB-32914.

Descriptors: *Equations, *Carbon, *Carbon dioxide, *Algae, Mathematical studies, Growth rates, Biological communities, Productivity. Groundwater, Rivers, Lakes, Biomass, Eutrophication.

It is interesting to know under what natural conditions carbon dioxide concentrations might be low enough to influence algal growth rates. Even if low carbon concentrations do not prevent cultural eutrophication, they could well influence the relative growth of different species. Equations describing the concentrations of the various inorganic carbon species in relation to pH and alkalinity may be combined with a chemical mass balance equation describing the rate of change of total inorganic carbon in a river due to photosynthesis, respiration, accrual from groundwater, and exchange with the atmosphere. The mass balance equation is solved to give carbon dioxide concentration throughout the day. Without accrual of groundwater the carbon dioxide concentration must lie in the range where it will influence growth rate of some plant species, but groundwater input prevents this situation in most rivers. In lakes, groundwater input and exchange with the aphotic zone may prevent the influence of carbon dioxide on algal growth rates. In waters with little groundwater input or little vertical mixing the carbon dioxide concentration may influence relative growth rates of species and thus the community composition but probably not the total plant biomass produced. (Jones-Wisconsin) W75-00579

Group 5C-Effects Of Pollution

INTERACTIONS OF PHYTOPLANKTERS CUL-TURED FROM A POLLUTED SALINE LAKE, ONONDAGA LAKE, NEW YORK, Cornell Univ., Ithaca, N.Y. Div. of Biological

Sciences.
P. Sze, and J. M. Kingsbury.
Journal of Phycology, Vol 10, No 1, p 5-8, 1974. 11 fig, 15 ref.

Descriptors: *Phytoplankton, *Plant populations, *Fluctuations, New York, Statistical methods, Plant growth, Chlamydomonas, Cultures, Limiting factors. Inhibition.

Identifiers: *Onondaga Lake(NY), Staurastrum paradoxum.

The interspecific interactions which may control the phytoplankton population fluctuations in Onondaga Lake, New York were investigated by studying the growth patterns in cultures of Chlamydomonas and Staurastrum sp. Chlamydomonas show several peaks annually with relatively brief periods of abundance, usually during the decline of another species. It was suggested that Chla-mydomonas is able to take advantage of brief periods of favorable conditions by means of its rapid growth rate. In contrast, Staurastrum paradoxum was consistently collected from late August through October 1969 but never occurred in large numbers. Interactions between Chla-mydomonas and Staurastrum in 2-membered cultures were analyzed by electronic particle counts and statistical methods to determine antagonistic, neutral, or stimulatory relationships. Over the range studied, growth of Staurastrum paradoxum is markedly reduced in the presence of Chla-mydomonas sp. Chlamydomonas growth is not affected by the presence of Staurastrum. The initial concentration of Staurastrum has an effect on its subsequent growth. The initial concentration of Chlamydomonas does not have an affect on its subsequent growth nor that of Staurastrum. These effects are apparently not mediated by a filterable factor or by competition for a nutrient. (Jones-Wisconsin)

BLOOMS OF AN ALGOPHOROUS AMOEBA ASSOCIATED WITH ANABAENA IN A FRESH WATER LAKE,

Georgia State Univ., Atlanta. Dept. of Biology. W. L. Cook, D. G. Ahearn, D. J. Reinhardt, and R.

Water, Air, and Soil Pollution, Vol 3, p 71-80, 1974. 5 fig, 1 tab, 8 ref.

Descriptors: *Eutrophication, *Anabaena, *Algal control, *Scum, Georgia, Sewage effluents, Aquatic microorganisms, Algae.
Identifiers: *Amoeba, Anabaena planctonica.

Blooms of the blue-green alga Anabaena planc-tonica in a northern Georgia fresh water lake were followed by massive development of a large al-gophorous, mayorellid-like amoeba. Thick surface scums of the alga occurred on the lee side of coves and inlets. Following the surface massing of A. planctonica, light tan to white streaks occurred within the blue-green surface aggregates and within 1-3 days the entire mass of blue-green algae was replaced by a white milk-like slick 1 to 2 mm in depth. Microscopically, the white surface scum was composed of a dense concentration of membrane- or wall-bound, orange-colored spheres, scattered filaments of A. planctonica, and a few large amoebae. Within the blue-green algal masses, numerous large, radiate, mayorellid-like algophorous amoebae, some nearly 300 micrometers in diameter, were observed. The formation of a heavy surface scum of the cyanophyta favored the development of the thick white scum, yet the amoeba also appeared to feed on the Anabaena at various depths. A. planctonica cultures failed to support amoeba growth, however. The algal-amoeba blooms were associated with waters en-riched with sewage effluents. Use of algophorous amoebae for natural control of nuisance algal blooms is suggested. (Jones-Wisconsin)

W75-00582

ALGAL EXCRETION AND BACTERIAL AS-SIMILATION IN HOT SPRING ALGAL MATS, Wisconsin Univ., Madison. Dept. of Bacteriology. J. Bauld, and T. D. Brock. Journal of Phycology, Vol 10, No 1, p 101-106, 1974. 2 fig, 2 tab, 34 ref. AEC C00-2161-14, NSF

GB 35046

Descriptors: *Algae, *Bacteria, *Hot springs, Organic matter, Cya Photosynthesis, Benthos. Cyanophyta, Identifiers: Algal excretion, Bacterial assimilation, Synechococcus lividus, Chloroflexis.

Algae and bacteria form compact benthic mats in effluents of alkaline hot springs at temperatures below about 73C. The green surface layer contains the unicellular cyanophyta Synechococcus lividus. Also present in the surface layer, and forming thick, orange mats beneath it, are filamentous gliding bacteria of the genus Chloroflexis which contain photosynthetic pigments. The very low species diversity and the constancy of the hot spring environment, make these mats a good ecosystem for studying the transfer of nutrients from the algae to the bacteria. To determine whether the algae might supply organic materials to the bacterium, excretion by natural populations of S. lividus was studied in the field by means of short-term radioisotope experiments. Under optimal conditions for photosynthesis, between 3 and 12% of the total C14 fixed was excreted as C14-labeled organic compounds. Except at very low light intensi-ties the percentage of fixed carbon excreted was very similar for all light intensities tested. C14labeled organic compounds excreted during algal photosynthesis are subsequently assimilated by natural populations of the bacteria present in the mat. (Jones-Wisconsin) W75-00583

SIGNIFICANCE OF NANOPLANKTON IN THE CHESAPEAKE BAY ESTUARY AND PROBLEMS ASSOCIATED WITH THE MEA-SUREMENT OF NANOPLANKTON PRODUC-

Johns Hopkins Univ., Baltimore, Md. Chesapeake

J. J. McCarthy, W. R. Taylor, and M. E. Loftus. Marine Biology, Vol 24, No 1, p 7-16, 1974. 4 fig, 5

*Measurement, Descriptors: *Nanoplankton, *Chesapeake Bay, *Productivity, Estuaries, Primary productivity, Herbivores, Zooplankton, Methodology, Phytoplankton, Basic data collections, Screens, Size.

The term nanoplankton has been defined by various investigators as the component of the plankton which passes their finest mesh net. This study investigated in time and space the significance of the vestigated in time and space the significance of the Chesapeake Bay nanoplankton and compared results of prescreening and postscreening techniques for estimating the nanoplankton contribution to the total phytoplankton productivity. Over a 2-year program of monthly cruises covering the entire Chesapeake Bay, the phytoplankters which passed through 35 micrometer mesh were repossible for 89 60% of the phytoplankton which passed through 35 micrometer mesh were responsible for 89,6% of the phytoplankton productivity. During a 1-week study, the <35 micrometer phytoplankton fraction was responsible for 93,4% of the chlorophyll-a and 100% of the primary productivity, while the <10 micrometer fraction was responsible for 81.3% of the chlorophyll-a and 94% of the productivity. The difference in biomass in the <35 micrometer and the <10 micrometer fractions was significant but no <10 micrometer fractions was significant, but no significant difference in productivity could be demonstrated. Laboratory experiments demon-strated that recently assimilated carbon can be lost with gravity screening. Considering both this and the effect of herbivorous zooplankters enclosed in productivity incubations, a prescreening rather than postscreening technique is recommended. (Jones-Wisconsin) W75-00584

KINETICS OF SILICON-LIMITED GROWTH IN THE MARINE DIATOM THALASSIOSIRA PSEUDONANA HASLE AND HEIMDAL (=CYCLOTELLA NANA HUSTEDT), Woods Hole Oceanographic Institution, Mass. R. R. L. Guillard, P. Killham, and T. A. Jackson. Journal of Phycology, Vol 9, No 3, p 233-237, 1973. I fig. 2 tab, 26 ref.

Descriptors: *Silica, *Plant growth, *Marine algae, *Diatoms, Estuaries, Growth rates, Kinetics, Absorption, Oceans, Algae. Identifiers: Thalassiosira pseudonana, Cyclotella nana, Sargasso Sea.

The two clones of Thalassiosira pseudonana studied are indistinguishable from each other with the light microscope though slight morphological differences can be seen in electron micrographs and there are considerable physiological differences between clones, they are considered as belonging to the same species. Both clones are axenic and were maintained in an enriched seawater medium. The half-saturation constant for growth and the maxium growth rate were determined for the clones under conditions in which external silicon clones under conditions in which external silicon concentrations controlled growth. Low silicon seawater for the experiment was prepared by allowing diatoms to remove silicon from Sargasso Sea surface water that has been stored in polyethylene bottles. The estuarine clone had a higher half-saturation constant and maximum growth rate than the clone from the Sargasso Sea. The half-saturation constant was for each clone are such that the silconstant values for each clone are such that the silicate levels found at certain times in both the Sargasso Sea and coastal regions are rate limiting to growth, hence can be of significance to plant production and to species succession. The yield data are consistent with the concept that growth rate and cellular silicon content vary together in silicon-limited cultures. (Jones-Wisconsin) W75-00586

TEMPERATURE EFFECTS OF ON PHYTOPLANKTON GROWTH, Michigan Univ., Ann Arbor. Dept. of Civil En-gineering. R. P. Canale, and A. H. Vogel.

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE1, p 231-241, 1974. 1 fig, 4 tab, 23 ref.

Descriptors: *Temperature, *Phytoplankton, *Plant growth, Reviews, Chlorophyta, Diatoms, Cyanophyta, Euglenophyta, Pyrrophyta, Chrysophyta.

Results of a literature review defines the effect of temperature on the growth of different phytoplankton groups. Quantification of these efphytoplankton groups. Quantification of these effects is essential to the construction of a multigroup phytoplankton model. All of the surveyed data is listed in tabular form. A graphical interpretation of these data is presented separating the effects into four phytoplankton taxa. Consideration is limited to mesothermic algae defined as those species whose growth rate is at a maximum between 0C and 40C. The possible range of the precise location of the peak of the green algae curve was quite narrow. The optimum temperature seemed to be about 35C. Optimum temperature for diatom growth is not well defined. However, lower temperatures below 26C and increases in temperadiatom growth is not well defined. However, lower temperatures below 26C and increases in temperature above 35C decrease the growth rate. An assumption of optimum growth at 30C seems justified for diatoms. Relatively little data are available defining the growth of blue-green algae at low temperatures. An estimation of the lower segment of the blue-green curve was made from the data available on Oscillatoria rubescens and an extrapolation of the temperature response of other species. (Jones-Wisconsin) W75-00587

Effects Of Pollution—Group 5C

SOME OBSERVATIONS ON INTERNAL RECYCLING, REGENERATION AND OSCILLATION OF DISSOLVED NITROGEN AND PHOSPHORUS IN SHALLOW SELF-CON-PHOSPHORUS IN SHALLOW SELF-CON-TAINED LAKES, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst.

I. Barica. Archiv fur Hydrobiologie, Vol 73, No 3, p 334-360, 1974. 15 fig, 3 tab, 35 ref.

*Nitrogen, *Cycling nutrients, *Shallow water, *Lakes, Canada, *Phosphorus, *Shallow water, *Lakes, Canada, Decomposing organic matter, Ammonia, Phosphates, Algae, Seasonal, Ice cover, Eutrophication, Chemical reactions, Fluctuations Identifiers: Erickson(Manitoba).

The four lakes discussed are some of about 50 being used for experiments with rainbow trout farming in midwestern winterkill lakes, located in southwestern Manitoba. The lakes exemplify one of the most extreme cases of summerkill with several consecutive algal blooms, a lake with less severe conditions of fish kills having only one algal bloom in late summer, a lake with blooms involv-ing algae other than Aphanizomenon flos-aquae, and a 'good' lake, suitable for fish farming, never attaining noxious blooms. From fluctuations in nutrient mass in the water column of these shallow lakes, it is possible to assume that the decomposing plankton is an important source of ammonia and phosphate. The cycle of these nutrients appears to be essentially internal and periodically repears to be essentiany internal and periodically re-peated. The nutrients were released from decom-posing algae during totally or partially anoxic con-ditions in mid-winter under ice and during short summer periods following the collapses of algal blooms. The ammonia and phosphate was subsequently assimilated by algae, transformed into particulate or dissolved organic form and rereleased. Oscillatory pattern of chemical rates in the bloom-collapse period was demonstrated. Dissolve organic nitrogen and dissolved organic phosphorus were produced by both living and decomposing algae. (Jones-Wisconsin) W75-00588

ON THE ROLLER PLANKTON OF SOME EAST AFRICAN LAKES, Uppsala Univ. (Sweden). Inst. of Zoology.

B. Peiler. Hydrobiologia, Vol 44, No 4, p 389-396, 1974. 19 fig, 1 tab, 20 ref.

Descriptors: *Rotifers, *Plankton, *Africa, Lakes, Alkalinity, Systematics.
Identifiers: Brachionus, Kenya, Tanzania.

Some plankton samples from a lake called western lake at Naivasha, Lake Magadi and Lake Nakuru in Kenya and Lake Natron in Tanzania were collected. The forms from these lakes largely agreed with descriptions found in litera-ture. The samples were collected in more or less central parts of the lakes, usually from a boat. The water bodies may be roughly divided into two groups: slightly alkaline with pH less than 10 and strongly alkaline with pH greater than 10. The rotifer plankton found in lakes of the first-mentioned group is reported. In the strongly alkaline water bodies, on the other hand, no rotifers were found, apart from Brachionus sp. which was en-countered in only one of the pools close to Lake Natron, in fairly great numbers. A discussion on the taxonomy and synonymics of most forms en-countered is given. Fifteen rotifers are listed and illustrated. (Jones-Wisconsin)

EUTROPHICATION, New York State Dept. of Environmental Conservation, Stony Brook. Value, Story Book. J. Foehrenbach, Jr. Journal of Water Pollution Control Federation, Vol 46, No 6, p 1350-1355, 1974. 28 ref. Descriptors: *Nutrient removal, *Eutrophication, *Algal control, Nitrogen, Phosphorus, Nitrates, Phosphates, Silica, Sodium, Productivity, Solar radiation, Sediments, Chlorine, Iron, Amino acids, Temperature, Nutrients, Copper, Diatoms, Aquatic plants, Ru-noff, Wastewater treatment, Destratification. Identifiers: Species diversity.

Several significant causes of eutrophication and control of algal growth are included in this litera-ture reveiew. Although nitrates and phosphates alone or in combination stimulated total algal growth in enrichment experiments, ionic Si caused increased diatom growth with perhaps sodium also causing an increase. In very restricted latitudes, nutrients were important but in all lakes analyzed, the amount of sunlight was the governing factor. Cladophora glomerata in Green Bay of Lake Michigan grew best at temperatures between 19 and 24C and could utilize very low light intensities. Because various estimates show that the world's supply of phosphate deposits will last only 100 to 145 years at present usage, elimination of phosphates from detergents and recycling of wastewater sludge is encouraged. Runoff from improper watershed management can add large amounts of nutrients. A change of species diversity may occur in aquatic ecosystems because of nutrient addition. Use of aquatic plants to remove nutrients and their subsequent harvest was reported. Control of the activated sludge process can produce effluents of varying concentrations of total P. (Jones-Wisconsin)

ON PLANKTON PRODUCTION IN KUNG-SBACKA FJORD, AN ESTUARY ON THE SWEDISH WEST COAST, Goteborg Univ. (Sweden). Inst. of Zoology; and

Uppsala Univ. (Sweden). Inst. of Zoology. I. Olsson, and E. Olundh.

Marine Biology, Vol 24, No 1, p 17-28, 1974. 9 fig,

Descriptors: *Plankton, *Primary productivity, *Fjords, *Estuaries, Sediments, Zooplankton, Secondary productivity, Carbon, Nitrogen, Phosphorus, Temperature, Copepods, Salinity, Statistical methods, Phytoplankton. Identifiers: *Kungsbacka Fjord(Sweden).

Environmental conditions, primary production, and zooplankton populations were studied during 1969-1970 at one station in Kungsbacka Fjord. Sweden. The fjord is a moderately polluted estuary, with a small tidal range. Rate of primary production was measured by the C-14 technique and in 1970 ammounted to about 100 g/C/sq m annually. The relationships between primary production and environmental factors were investigated using Spearman's rank correlation coefficient. The two rivers, Kungsbacka and Rolfsa, which flow into the fjord, brought on an average, 45 tons of nitrogen and 4.5 tons of phosphorus and 380 tons of organic carbon per month during the period of investigation. The rank correlation coefficient between fresh-water inflow and primary production was, however, negative. Primary production displayed strong correlation with temperature at different depths, indicating the sediments to be the most important nutrient source. There was a significant positive correlation between photosynthetic production and surface salinity. Salinity fluctuations were mainly caused by dilution, not be upwelling. Nineteen holoplanktonic species were found. Copepods comprised the most numerous group, averaging 70% of the zooplank-ton during February-April and 46% during May-November. Zooplankton abundance and biomass displayed the same fluctuations in both years, with a maximum in June. (Jones-Wisconsin) W75-00593 THE BENTHIC ALGAE OF SOUTHERN BAF-FIN ISLAND. I. EPIPELIC COMMUNITIES IN RIVERS.

Bath Univ. (England). School of Biological J. W. Moore.

Journal of Phycology, Vol 10, No 1, p 50-57, 1974. 4 fig, 4 tab, 22 ref.

Descriptors: *Benthic flora, *Algae, *Rivers, Sediments, Biological communities, Dominant organisms, Arctic, Chemical properties, Physical properties, Systematics, Chlorophyta, Standing crops, Pyrrophyta, Cyanophyta, Euglenophyta, Chrysophyta.

*Baffin Island(Canada), BaccilIdentifiers: *Baffin Island(Canada)

Epipelic algae found in association with river sediments in the southern part of Baffin Island are described with particular attention given to the composition and structure of the communities during their growing season and to the physical, chemical, and biological factors which effect them. Temporal fluctuation in dissolved oxygen, carbon dioxide, total and orthophosphate, alkalinity, hardness, temperature, and discharge in water from River A is presented. The overall assemblage consisted of 240 taxa, of which 200 belonged to the Bacillariophyta and only 17 to the Chlorophyta. Members of the Bacillariophyta accounted for 87-100% by numbers and 44-100% by volume of the algae at most localities. The chlorophyta comprised 0-7% by numbers and 0-30% by volume. The standing crop of the dominant taxa in the dif-ferent rivers is given. Temperature and light are considered important factors in the regulation of algal numbers, while nutrient supply in the overlying water, grazing by herbivores, wave action, and flooding appeared to have little effect. The mean ratio for all rivers lariophyta:Cyanophyta:Chlo for rophyta:Euglenophyta:Pyrrophyta:Chrysophyta

was 84:8:7:0.3:0.3, respectively. (Jones-Wisconsin)

W75-00594

NATURAL. EUTROPHICATION AND IM-PROVEMENT OF LAKE QUALITY: A CASE HISTORY, ONEIDA LAKE, NEW YORK, Geological Survey, Albany, N.Y. P. E. Greeson.

In: Short Papers of the Eighth American Water Resources Conference, St Louis, Missouri, October 30-November 2, 1972: American Water Resources Association Proceedings Series No 16, n 82, 1972.

Descriptors: *Eutrophication, *Lakes, *New York, *Water quality control, Diversion, Water balance, Water levels.
Identifiers: *Oneida Lake(NY).

A major lake which has escaped artificial en-richment and the consequent cultural eutrophication is Oneida Lake, New York. An intensive, 2-1/2 year study was made of this unique lake and its drainage basin to provide new insights into the mechanisms of natural lake eutrophication. Oneida Lake is the largest lake wholly within New York State and is used almost exclusively for recreation purposes. During the summer months, the lake characteristically exhibits a tremendous growth of planktonic, blue-green algae. The recreational aspects of the lake are hindered, and the decomposition of algae along the shore becomes aesthetically unpleasant. About 12% of the total inflowing nutrients result from the activities of man. The remaining 88% of the nutrients originate from natural sources. The Oneida Lake basin is drained by eight major tributary systems, four from the north and four from the south. The four major northern tributaries carry 62% of the water but only 17% of the total nutrients. The four major southern tributaries to the lake carry 28% of the water and 71% of the total inflowing nutrients. To reduce nuisance algal blooms in the lake, one

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of the best control alternatives consists of diversion of nutrient-rich water now entering the lake from the southern tributaries. The effect of diversion of the southern tributaries around Oneida Lake would be to reduce or to eliminate the severe annual algal blooms in the lake, while having little or no adverse effect on water levels or any other environmental or cultural system. (Knapp-USGS)

A SYSTEMATICAL AND ECOLOGICAL STUDY OF THE DIATOM FLORA OF LESOTHO WITH SPECIAL REFERENCE TO THE WATER QUALITY,

National Inst. for Water Research, Pretoria (South Africa).

R. Schoeman.

355 p. Maps and Illus. 1973.

Descriptors: Africa, *Analytical techniques, *Water quality, Alkalinity, Oxygen, Pollutants, Nitrogen compounds, Farm wastes, Wastes, Water pollution, *Water pollution sources, *Diatoms.

Identifiers: Achnanthes-lesothensis, Cymbellalesothensis, Eunotia-spp, Flora, Fragilaria-spp, Lesotho, Navicula-spp, Nitzschia-spp, Pinnularia-spp, Rhoicosphenia-lesothensis, Stauroneis-spp, South Africa, Statistical analysis, Livestock

The systematics, taxonomy and autecology of the Diatomeae of Lesotho are discussed. A number of Diatomeae of Lesotho are alscussed. A number of new species are described (Achnanthes lesothen-sis, Cymbella lesothensis, Eunotia spp. (3), Fragilaria spp. (2), Rhoicosphenia lesothensis, Navicula spp. (11), Nitzschia spp. (3), Pinnularia spp. (4) and Stauroneis spp. (2)). Other species of interest are commented on and figured. The diatom associations from each sampling site were subjected to a statistical analysis in order to determine the relative densities of the different species in the association. Using the diatom species as ecological indicators, the water quality of Lesotho was assessed. These diatom associations indicated that the majority of the waters sampled are al-kaline and usually oxygen rich. Water pollution by organic nitrogenous compounds is serious. This is attributed to the densely populated rural areas with their large numbers of livestock. In a few samples, pollution by carbohydrates was detected. Brackish water associations were rarely found and appear to be restricted to the lowland areas of Lesotho and the bordering Orange Free State. Copyright 1974, Biological Abstracts, Inc.

THE LOWER MADISON LAKES FIFTEEN YEARS FOLLOWING SEWAGE DIVERSION, Wisconsin Univ., Madison. Water Chemistry Program. W. C. Sonzogni, G. P. Fitzgerald, and G. F. Lee.

Mimeo, undated. 23 p, 3 fig, 17 ref. EPA 16-02-EHR R-802464.

Descriptors: *Lakes, *Sewage effluents, *Diversion, *Water quality control, Wisconsin, Phosphorus, Algae, Eutrophication, Cyanophyta, Shallow water.
Identifiers: *Madison(Wis), Species diversity,

Sewage diversion.

In December 1958 Madison's treated sewage effluent was completely diverted around the lower Waubesa and Kegonsa Lakes, and discharged to the lower Yahara River via Badfish Creek long term effects on water quality resulting from this diversion of treated sewage effluent are ex-amined. The current status of the lakes after a period of about fifteen years, is reported. Based on the data available, the phosphorus content of both Waubesa and Kegonsa appears to have responded rapidly and permanently to the decreased phosphorus loading. Strong evidence is presented against extensive buffering effects of the sediments, whereby phosphorus is released from the sediments in response to changes in the phosphorus concentration of the overlying water. A notable increase in the species diversity of the algae in the lower lakes was found after the diversion, particularly in Lake Waubesa. Algal species diversity has remained greater than before diversion and the greater diversity has resulted in an im-provement in water quality due to fewer number of blue-green algal blooms. Despite the diversion, the lower lakes still are highly eutrophic but this is expected based on their current phosphorus in-come and shallow depth. (Jones-Wisconsin)

THE SEASONAL AND SPATIAL DISTRIBU-TION OF SOME BENTHIC CILIATED PROTOZOA IN ESTHWAITE WATER, Freshwater Biological Association, Ambleside (England).

Freshwater Biology, Vol 4, No 2, p 127-147, 1974. 9 fig. 3 tab. 27 ref.

*Biological Descriptors: communities. *Distribution, *Benthic fauna, *Protozoa, Spatial distribution, Depth, Oxygen, Temporal distribution, Density, Standing crops, Sediments, Seasonal, Food abundance. Identifiers: *Esthwaite Water(England).

Seasonal fluctuations in populations of a few common ciliates found at several sites at different depths in Esthwaite Water, England are described. Some physical and chemical parameters (oxygen, temperature, sulphide, ammonia, pH, alkalinity and carbon dioxide) were measured with the aims of describing the habitat and to identify any obvious correlations between ciliates and physicochemical features. Data were collected on biological and physical features which might influence horizontal distribution of ciliates, includ-ing the standing crops of viable bacteria and the alga Microcystis aeruginosa and the density and organic content of the sediment. The benthic ciliated Protozoa considered were Loxodes magnus, L. striatus, Frontonia Leucas, Spirostomum minus, S. teres, Stentor coeruleus, S. polymorphus and Caenomopha medusula. Population densities were assessed as number of in-dividuals per 0.1 ml of sediment. It was found that the most dense populations tended to be at deeper sites, population maxima generally occurred when the bottom water was oxygenated (except C. medusula) and there was, over the 21 months, considerable irregularity in the size and timing of population maxima. Availability of food organisms, turbulence and sediment testure were considered as factors which might control their dis-tribution. (Jones-Wisconsin) W75-00668

THE INFLUENCE OF INORGANIC NITROGEN SUPPLY ON CARBOHYDRATE AND RELATED METABOLISM IN THE BLUE-GREEN ALGA, ANABAENA CYLINDRICA LEMM, Bristol Univ. (England). Dept. of Botany. T. Batt, and D. H. Brown.

Planta (Berl.), Vol 116, No 3, p 197-206, 1974. 4 tab, 32 ref.

Descriptors: Descriptors: *Carbohydrates, *Mete *Cyanophyta, *Biochemistry, N Anabaena, Enzymes, Amino acids, Algae. *Metabolism. Nitrogen, Identifiers: Anabaena cylindrica.

The regulation of certain enzymes involved in amino acid biosynthesis in Anabaena cylindrica may be mediated by the availability of pyridine nucleotides, as determined by the reductant requirements of nitrogenase and nitrite and nitrate reductases. This investigation establishes the consequence of such demands upon enzymes representative of the pentose phosphate pathway, glycolysis, and the tricarbxylic acid cycle and re-lated reactions. A. cylindrica was cultured to provide nitrogen-fixing, ammonia, nitrite, and nitrateassimilating filaments. Protein contents of ap-propriately diluted cell-free preparations were determined. Enzymes representative of, and related to, the pentose phosphate pathway, glycoly-sis, and the tricarboxylic acid cycle have been domonstrated in supernatant and lamellar fractions of A. cylindrica cultured in the presence of atmospheric nitrogen, ammonia, nitrite, and nitrate. Nitrogen-fixing and ammonia-assimilating algae contained essentially similar levels of most enzymes tested, with the notable exception of glyceraldehyde-3-phosphate dehydrogenase which showed increased NADPH-linked activity with concomitant diminution of NADH-linked activity when ammonia was supplied. The provision of nitrite or nitrate caused significant enhancements of glucose-6-phosphate dehydrogenase, 6phosphogluconate dehydrogenase, and the related hexokinase and phospho-hexoisomerase. Results are considered to indicate regulation of glue-green algal metabolism determined by the availability of pyridine nucleotides. (Jones-Wisconsin) W75-00670

AERATION REVITALIZES RESERVOIR, Schramm, Inc., West Chester, Pa. Aeration Div. J. R. McCullough. ater and Sewage Works, Vol 121, No 6, p 84-85, 1974. 2 fig.

*Aeration, Descriptors: *Reservoirs, *Destratification, Algal control, Recreation, Algae, Pennsylvania. Identifiers: *Prompton Lake(Penn).

To control algal blooms which interfered with recreation in Prompton Lake, a reservoir in northeastern Pennsylvania, a dual pressure destratification system was designed which fed air into a primary manifold at 70 to 100 psig and metered into diffusers through a patented device at 50-ft intervals. Air is channeled in two directions so that the effective distance it must travel from the metering device is 25 feet. The air is released from the diffusers in sufficient volume with just enough pressure to overcome the hydrostatic head. The dual pressure air diffuser was installed in June 1973 in the deepest part of the reservoir, approximately at the center beginning at the point 325 ft upstream from the dam breast and extending 200 ft upstream. A galvanized pipe line connected the diffuser with a gasoline-driven compressor generating 160 cu ft/min at 100 lbs pressure. It was run 24 hrs/day for three days, then reduced to 8 hrs/day: then resumed for a week at 24 hrs/day. Temperature readings, at various depths showed a naximum difference of 2F between the surface and the bottom at the deepest points. Algae blooms were completely controlled in the lower reaches of the reservoir. (Auen-Wisconsin) W75-00671

A NON-TOXIC LAKE MANAGEMENT PRO-GRAM.

Clean-Flo Labs., Inc., Hopkins, Minn. R. L. Laing. Hyacinth Control Journal, Vol 12, p 41-43, 1974. 1

Descriptors: *Nutrient removal, *Aeration, *Chemical precipitation, Calcium, Phosphates, Carbon dioxide, Water quality control. Identifiers: Lake restoration, Clean-Flo Lake Cleanser.

An aeration system and its mode of operation, based on aeration requirements, depth of bottom muck or peat, and bottom topography, are described. The total concept of the aerator is to move as much water from the bottom to the surface as economically as possible, and then let the wind oxygenate the water and allow diffusion of wind oxygenate the water and allow diffusion of unwanted gasses to the atmosphere. About 3,000 gpm was observed rising to the surface from a dif-fuser at 6 ft deep with a 0.33 hp compressor. The same unit produced at 12,000 pgm at 12 ft depth.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5 Effects Of Pollution—Group 5C

When carbon dioxide reaches approximately 5 ppm and pH is over 8.0, the phosphate precipitant may be added. Precipitant level is determined approximately by organic muck, manganese, iron and total phosphorus remaining after carbon dioxide has reached a minimum level. A soluble, nontoxic calcium-based product was tested in 25 Min-nesota lakes and 8 in Florida. Generally, 5 to 30 ppm was added and phosphate removal ranged from 70 to 100%. After using the aerator and subsequent application of Clean-Flow Lake Cleanser, all signs of muck was gone in two weeks, revealing a clean sandy bottom in a trout fishery pond. (Auen-Wisconsin)

NITROGEN FIXATION (ACETYLENE REDUC-TION) BY PHYTOPLANKTON IN GREEN BAY, LAKE MICHIGAN, IN RELATION TO NUTRIENT CONCENTRATIONS, Illinois Univ., Urbana. Dept. of Botany. L. N. Vanderhoef, C.-Y. Huang, R. Musil, and J. Williams. Limnology and Oceanography, Vol 19, No 1, p 119-125, 1974. 5 fig, 1 tab, 23 ref.

Descriptors: *Nitrogen fixation, *Phytoplankton, Nutrients, Cyanophyta, Ammonia, Nitrates, Standing crops, Diatoms, Wisconsin, Phosphates, Eutrophication, Water pollution treatment, Limiting factors.
Identifiers: *Green Bay(Lake Michigan), Micro-

cystis, Aphanizomenon, Fox River(Wis).

Nitrogen fixation and the growth of blue-green algae were studied in Green Bay of Lake Michigan. Samples were taken at various locations in the sampling area at 1-m intervals to a depth of 8 in the sampling area at 1-m intervals to a depth of to 11 m. Acetylene reduction consistently occurred in depths down to 5 m. Where concentrations of all nutrients were high Microcystis predominated. As combined nitrogen concentrations decreased Aphanizomenon increased. Aphanizomenon showed increasing acetylenereducing efficiency as the ammonium-nitrate concentration declined, but its standing crop decreased with declining P concentration. At 40 km from the Fox River diatoms predominated. Increased algal growth and nitrogen fixation in 1972, as compared to 1971, correlated with higher as compared to 1971, correlated with nighter phosphate concentrations. Almost half as much nitrogen was added to the bay by fixation as was delivered by the Fox River during the same period. The transition in Green Bay from oligotrophic site 14 to highly eutrophic sites 1-4 indicates the marked effect of nutrient discharge into a large body of water. It appears that phosphorus is most often the limiting nutrient in algal growth in Green Bay. Removal of commercial and domestic wastewater effluents from the bay may be essential in controlling future algal blooms. (Jones-Wisconsin) W75-00673

SEASONAL PERIODICITY OF PLANKTON IN A FRESHWATER POND IN WEST BENGAL,

Kalyani Univ. (India). Dept. of Zoology. For primary bibliographic entry see Field 2H. W75-00674

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES, Cornell Univ., Ithaca, N.Y. Water Resources and

Marine Sciences Center. L. B. Dworsky, G. R. Francis, and C. F. Swezey. Natural Resources Journal, Vol 14, No 1, p 103-

Descriptors: *Management, *International Joint Commission, *Great Lakes, Canada, Institutions, United States, Water pollution control, Land use, Water level, Navigation, Powerplants, Water quality, Water supply, Nuclear powerplants, Recreation, Widlife habitats, Irrigation, Shore protection, Waste disposal, Flood control, Fish conservation, Regional economics, Great Lakes

The present situation regarding resource use problems of the Great Lakes Basin and the concluions and recommendations of a Canada-United States University Seminar are presented. There are serious water pollution problems in Lakes Michigan, Erie and Ontario; air pollution concerns in the Detroit-Windsor area and on the Niagara frontier; fishery resource depletion; and numerous land use mismanagement and other resource management problems. Lake Erie, the western end of Lake Ontario and the southern end of Lake Michigan suffer from pollution in almost all its forms. Nothing has proved adequate in dealing with the problems of habitat destruction on a large scale or of the malevolent effects of pollution. Interests affected by variations in the water levels and outflows are considered in three general categories: the shore property, navigation, and hydropower. Development planning on a joint basis is now a prerequisite. In its search for an im-proved institutional structure for water and related land resources management in the Great Lakes Basin, the existing organizational forms and some combinations thereof were considered as to their suitability as models for an institutional arrange-ment for the management of the Great Lakes. (Jones-Wisconsin) W75-00676

SOME PROBLEMS AND PERSPECTIVES IN APPLIED LIMNOLOGY,

K. Wuhrmann.
Mitteilungen Internationale Vereinigung Lim-nologie, Vol 20, p 324-402, 1974. 15 fig, 15 tab, 158 ref.

Descriptors: *Limnology, *Classification, *Rivers, Ecosystems, Chemical properties, Heavy Descriptors: metals, Organic compounds, Bioassay, Biological communities, Water quality, Physicochemical properties, Self-purification, Eutrophication, Water pollution, Growth rates, Primary productivity, Energy loss.
Identifiers: Terminology.

The sector of applied limpology discussed covers direct or indirect effects on river ecosystems produced by the imports of chemicals from anthropogenic activity. Progress and omissions in the endeavors to comprehend 'pollution' as a mul-titude of interrelated ecological factors and to in-vestigate their effects and mode of action are reviewed. Implementation of any measures aimed at minimizing anthropogenic adverse effects requires well founded predictions of reactions of aquatic biocenoses and of the behavior of aquatic ecosystems to shifts of physicochemical characteristics. Slow introduction of modern analytical chemistry into applied limnology, and a certain be-lief in the omnipotence of aquatic organisms and communities as 'analytical' tools and information producers on ecological factors, impeded progress towards a better understanding of the response of river ecosystems to chemical changes. Recognition of the driving forces and the mechanisms of community formation and maintenance is, however, at the root of causal application of limnology in water resources management. Future progress in the application of limnology in water pollution control depends, therefore, to a great extent on improvements in the definition and quantification man-made chemical stresses on lotic environments and in the acceptance and adequate use of current ecological concepts for the interpretation of 'pollution' phenomena. (Auen-Wisconsin) W75-00677

FURTHER INVESTIGATION AS TO THE CAUSE AND EFFECT OF EUTROPHICATION IN LONG LAKE, WASHINGTON, Eastern Washington State Coll., Cheney. Dept. of

Biology. R. A. Soltero, A. F. Gasperino, and W. G. Graham.

Completion Report D.O.E. Project 74-025A, July 1, 1974. 84 p. 21 fig, 22 tab, 56 ref.

Descriptors: *Eutrophication, *Reservoirs, Washington, Temperature, Water chemistry, Phytoplankton, Standing crops, Chlorophyll, Primary productivity, Zooplankton, Conductivity, Phosphates, Nitrates, Silica, Currents(Water), Density, Thermal stratification, Inflow, Nutrients, Nitrogen, Systematics.
Identifiers: *Long Lake(Wash), Spokane

River(Wash).

A comprehensive investigation of the reservoir was conducted to determine its productivity status due to the increased frequency of massive algal blooms and increased macrophyte growth in the shallower portions. Data was obtained on nutrient levels, temperature, dissolved oxygen, pH, conductivity, turbidity, total alkalinity, and nutrient sources to prepare a budget of the various nitrogen and phosphorus fractions based on the inflow-outflow and storage of each fraction; to prepare a salinity budget, the total organic and inorganic residues, and the percentage of organic matter in the surface sediments. Results indicated that primary productivity levels, phytoplankton standing crops, and chlorophyll-a concentrations had increased. Internal currents contributed to the complex interaction of density flow, thermal stratification, and seasonal inflow and outflow. The summer down-reservoir flow of the Spokane River occurred as an interflow at the power penstock elevation and isolated a wedge of water on the bottom which became anaerobic. The reservoir's phytoplankton production was sufficient to sub-stantiate phytoplankton decomposition as the cause of hypolimnetic anoxia. A nutrient source, which could support excessive phytoplankton growth, was the reduced bottom sediments since there was an orthophosphate and inorganic nitrogen maxima during anaerobiosis. The Spokane primary sewage treatment plant effluents were another major nutrient source. (Auen-Wisconsin) W75-00678

THE SEASONAL VARIATION AND DISTRIBU-TION OF PHYTOPLANKTON IN THE RIVER OSHUN, NIGERIA,

Ibadan Univ. (Nigeria). Dept. of Zoology.

A. B. M. Egborge. Freshwater Biology, Vol 4, No 2, p 177-191, 1974. 11 fig, 2 tab, 14 ref.

Descriptors: *Biological communities, *Seasonal, *Distribution, *Phytoplankton, Diatoms, Im-*Distribution, poundments, Discharge(Water), Chlorophyta, Cyanophyta, Nitrates, Dinoflagellates, Rivers, Light penetration, Dominant organisms. Identifiers: *Nigeria, River Oshun(Nigeria), Baccilariophyceae, Volvocaceae, Dinophyceae,

This first record of phytoplankton periodicity in the small Nigerian Oshund River involved observation of the fortnightly variations in abundance of the Desmidiaceae, Cyanophyceae, Chlorophyceae, Dinophyceae and the Baccil-lariophyceae. Observations started a year before the transformation of part of the Oshun from a fluviatile to a lacustrine condition and ended four weeks after provide information on the phytoplankton changes in a small impoundment. The pattern of seasonal variation of the total phytoplankton, generally similar at the three sam-pling stations, was computed. The river was dominated by the Bacciliariophyceae throughout the period before impoundment, but soon after Volvocaceae and Dinophyceae became prepon-derant at the lake although the diatoms remained dominant at the source. The period of maximum diatom abundance occurred eight weeks before that other phytoplankton groups attained their maxima in the river. The relative abundance of the five phytoplanktonic groups was estimated by cal-culating the percentage each group formed of the

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total phytoplankton. It is perhaps significant that the colonial Chlorophyceae were the first to colonize the backwaters. Correlation coefficient values enumerated by computer revealed the controlling effect of the discharge, transparency and nitrate nitrogen on phytoplankton development in the Oshun. (Jones-Wisconsin)

A QUANTITATIVE STUDY OF NUTRIENT FRACTIONS AND A STOICHIOMETRIC MODEL OF THE BALTIC, Goteborg Univ. (Sweden). Oceanographic Inst.; and Institute of Marine Research, Helsinki

(Finland)

R. S. Gupta, and F. Koroleff. Estuarine and Coastal Marine Science, Vol 1, No 4, p 335-360, 1973. 12 fig, 3 tab, 64 ref.

Descriptors: *Mathematical studies, *Oceans, Nutrients, Phosphorus, Nitrogen, Dissolved oxygen, Hydrogen sulfide, Humus, Chemical properties, Physical properties, Plankton, Denitrification.

Identifiers: *Stoichiometric model, *Baltic Sea.

Approximate relationships between phosphorus, nitrogen compounds, dissolved oxygen and hydrogen sulphide based on values observed in the Baltic Sea are examined. Chemical and physical observations included salinity, temperature, dissolved oxygen, inorganic phosphate, total phosphorus, nitrate, nitrite, ammonia, total nitrogen, pH, alkalinity and dissolved hydrogen sulphide. Reserved' and oxidatively regenerated inorganic nitrogen and phosphorus fractions were estimated. The organic phosphorus fraction is dominant in the photic layer whereas the oxidative phosphorus fraction is dominant below the photic layer. Organic nitrogen is dominant at all depths. A clear deficiency in nitrate in relation to the available oxygen is observed in the upper layers. Part of the phosphate appears to be reprecipitated upon recovered appears to be receptated about recovered appears of the bottom waters. A stoichiometric model indicates that plankton organisms have approximate atomic ratios for C:N:P of 154: 13: 1, while the ratio of change for nitrogen and phosphorus is only 4:1 by atoms. This is probably because of high quantity of terrestrial humus in the Baltic, or slow rate of regeneration of nitrogenous material, or reduction of nitrate to antiogen gas even in the presence of excess oxygen and/or assimilation and regeneration in organic forms. (Jones-Wisconsin)

EFFECT OF WASTEWATER ORGANIC FRACTIONS ON THE GROWTH OF SELECTED ALGAE,

Albany County Sewer District, N.Y.; and Rensselaer Univ., Troy, N.Y. Fresh Water Inst. G. C. McDonald, and N. L. Clesceri.

In: Bioassay Techniques and Environmental Chemistry, Ann Arbor Science Publishers, Inc., Michigan, 1973, p 479-496. FWI Report 71-13. 6 fig, 6 tab, 12 ref. EPA 16010-DHN.

Descriptors: *Sewage effluents, *Organic matter, *Eutrophication, Bioassay, Anabaena, Algae, Growth rates. Identifiers: Selenastrum capricornutum.

Anabaena flos-aquae.

The existence and extent of algal growth enhancement brought about by the addition of wastewater organic fractions to representative algal cultures were determined. A sample of effluent from a conventional activated sludge facility located at Batavia, New York was subjected to fractionation using gel chromatographic techniques. Subsequent to filtration and freeze drying, the concentrated wastewater was separated into organic fractions by gel chromatography. Algae selected for the study were Selenastrum capricornutum and Annabaena flosaquae. Growth of both species was determined by absorbance measurements at 750 nm with a Beckman DU-2 spectrophotometer. Organic compounds contained in wastewater fracgame compounds contained in wastewater rac-tions have been found to exert a growth-enhancing effect on the two algae species. The exact nature of the causative growth factors and the pathway by which they achieve their effects are as yet unknown, and further investigative efforts are being conducted to assess generality of these results. This undertaking is important as increased algal productivity may continue to occur if such factors are general constituents of wastewater effluents, notwithstanding the removal of nitrogen and phosphorus from such effluents. (Jones-Wiscon-W75-00681

STUDIES ON PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA). I. MAN-

IN PORTO NOVO WATERS (INDIA). I. MANGROVE,
Marine Biological Station, Porto Novo (India).
V. Sundararaj, and K. Krishnamurthy.
Journal of Experimental Marine Biology and
Ecology, Vol 14, No 3, p 275-284, 1974. 38 ref.

*Phytoplankton, Descriptors: Chlorophyll, Mangrove swamps, Marine biology. Identifiers: *Porto Novo(India), Carotenoids, Phaeopigments.

The luxuriant mangrove forests of Pichavaram are located near Porto Novo and extend along the Coromandal Coast of India. This study discloses some interesting features regarding the concentra-tion and distribution of pigments in different aquatic biotopes and their variations. The annual variations of phytoplankton pigments were studied from January to December 1971, at two stations of the mangrove environment. Chlorophyll-a varied from 2.90 to 35.06, chlorophyll-b from 0 to 10.02, and chlorophyll-c from 0 to 18.12 micrograms/1. Plant carotenoids varied from 1.56 to 13.83 MSPU/cu m and phaeopigments from 0 to 12.28 misroframs/1. The primary peak of chlorophyll-a was recorded during March at Station 1, and dur-ing June at Station 2. A secondary maxima oc-curred during June and August at Station 1, and during September at Station 2. Chlorophyll-a was the dominant pigment at both stations, followed by chlorophyll-c and chlorophyll-b. The increase in the concentration of pigments was mainly due to the presence of phytoplankton species belonging to Coscinodiscus, Rhizosolenia, Thalassiothrix, Melosira, Chaetoceros and Biddulphia. (Jones-Wisconsin) W75-00682

HISTORY OF LIMNOLOGY,

Freiburg Univ. (West Germany). Limnologisches Institut. H-J. Elster.

Mitteilungen Internationale Vereinigung Lim-nologie, Vol 20, p 7-30, 1974. 180 ref.

Descriptors: *Limnology, *History, Lakes, Rivers, Classification, Ecosystems, Ecology, Methodology. Identifiers: Inter-disciplinary approach

Limnology is the science of inland waters as a whole and includes everything that affects inland water-hydrography and biology. Freshwater biology or biology of fresh water is primarily ecology, both autecology and synecology, the latter revealing its particular individuality. Limnology is a synthetic science for which purely zoological or botanical studies, though necessary, are no more than preliminaries. Before the days of limnology, geologists, geographers, physicists and chemists brought important data together but failed to explain the phenomena of biological origin. The first concept of the limnological ecosystem was put forward by Forbes (1887) writing 'The Lake as a Microcosm.' Forel's monograph of Lac Leman (1892-1904) commonly regarded as the beginning of scientific limnology, was the first comprehensive study of a lake. New ideas came with formation of the SIL (Societas Internationalis Limnologiae theoreticae et ap-plicatae.) Limnology demands prolonged intensive interplay between coordinated outdoor experi-ments on all parts of the system and work directed to analyze the causes, becoming a comprehensive science of fresh-water, through synthesis on one hand and restriction to analytical natural science on the other. (Jones-Wisconsin) W75-00684

A GENERAL THEORY OF STEADY STATE
PHYTOPLANKTON GROWTH IN A NUTRIENT
SATURATED MIXED LAYER,
Rochester Univ., New York. Dept. of Biology.
T. T. Benerater.

T. T. Bannister.

Limnology and Oceanography, Vol 19, No 1, p 13-30, 1974. 8 fig, 2 tab, 47 ref.

Descriptors: *Theoretical analysis, *Standing Descriptors: "Incoretical analysis, "Standing crops, "Phyloplankton, "Growth rates, Nutrients, Primary productivity, Mathematical studies, En-vironmental effects, Eutrophication, Equations, Identifiers: "Steady-state growth, Phytoplankton

The theory presented shows how steady-state crop density, daily production, and growth rate in a nutrient saturated epilimnion are related to environmental variables-incident illumination, mixed layer depth, nonphytoplankton absorption, sedimentation, and primary consumption. For this case, a mathematical statement of the theory requires seven equations: two expressing crop density and primary production as a function of environmental variables and phytoplankton parameters; one stating the dependence of the upper limit for daily production on incident light and phytoplankton parameters; three stating dependence of phytoplankton parameters on growth rate; and one describing phytoplankton losses to primary consumers. The first six can be quantitatively stated on the basis of existing experimental information. The seventh cannot, and it is tentatively assumed that consumption is regulated in a way that maximizes the steady-state harvest. Graphs of predicted crop density and primary production, as general functions of nonphytoplankton absorption and sedimentation rate, are used to predict quantitative consequences of changes in seasonal data, sedimentation rate, nonphytoplankton light absorption, and mixed layer depth. A cooperative and intensive study of lakes of differing fertility, but all supporting fairly stable crops, could be the shortest path to better understanding phytoplankton growth. (Jones-Wisconsin) W75-00685

STUDIES ON ABSORPTION OF P32, FE59, AND CA45 BY WATER-MILFOIL (MYRIOPHYLLUM EXALBESCENS FERNALD),

Pittsburgh Univ., Pa. Pymatuning Lab. of Ecolo-

By.
J. A. DeMarte, and R. T. Hartman.
Ecology, Vol 55, No 1, p 188-194, 1974. 4 fig, 4 tab, 18 ref. AEC AT(30-1)-2018.

Descriptors: *Absorption, *Phosphorus, *Aquatic plants, *Cycling nutrients, Iron, Calcium, Radioisotopes, Translocation, Inorganic compounds, Phosphates, Analytical techniques. Identifiers: *Watermilfoil, Myriophyllum exal-

A method used isolated root and shoot systems of experimental plants permitting the plants to be rooted in natural substrate and to remain intact during uptake studies. Shoot portion of the plant ided over the lip of the breaker into the surrounding water. A heavy seal around the stem prevented mixing of the separated media. Au-toradiographs and radioactivity measurements provided direct evidence that P32, Fe59, and Ca45 were absorbed by roots of Myriophyllum exal-bescens and translocated to shoot tissues. Similar

W75-00696

Effects Of Pollution—Group 5C

evidence was obtained for absorption of P32 by shoots and translocation to roots. Data from ex-periments designed to compare the effects of substrate type and the presence or absence of light showed no significant difference in the amounts of P32 absorbed by roots. Translocation of Fe59 from root to shoot tissues occurred mainly when plants were rooted in muck. Ca45 translocation from roots to shoots was greatest for plants rooted in sand and maintained in the light. P32 was generally distributed throughout Myriophyllum. P32 absorbed by the roots was translocated to the shoot system and released to the surrounding water, providing an additional pathway for phosphorus cycling in freshwater environments. (Jones-Wisconsin) W75-00686

SEASONAL CHANGES IN THE CHEMICAL COMPOSITION OF THE RED ALGA HYPNEA MUSCIFORMIS,

MUSCIFORMIS, Cairo Univ., Giza (Egypt). Dept. of Chemistry. A. F. Abdel Fattah, N. M. Abed, and M. Edrees. Australian Journal of Marine and Freshwater Research, Vol 24, No 3, p 275-279, 1973.

Descriptors: *Marine algae, *Biochemistry, *Rhodophyta, Lipids, Carbohydrates, Amino acids, Proteins, Variability, Seasonal, Algae. Identifiers: *Seaweeds, Hypnea musciformis, Cholesterol, Lanosterol, Mannitol, Galactose, Glucose, Xylose, Glucuronic acid, Lactone, Roushdy(Egypt).

The composition of marine algae depends on several factors, among which is the season of the year. Therefore, for enhancing industrial utilization of marine algae, it is necessary to investigate their chemical constituents in different seasons. Samples of the red algal species Hypnea muscifor-Samples of the red algar species ryspinea muscrioms were collected periodically in 1971-1972 from the same place at Roushdy, Alexandria, Egypt. Values were calculated on dry weight basis. Seasonal changes were observed in the chemical composition of the alga. Lipids, cholesterol, and lanosterol were found as constituents of the algal material. No low-molecular weight carbohydrates were found except small amounts of mannitol. The algal hydrolysate was shown to contain galactose. glucose, and xylose in all seasons and was characterized by a high content of glucuronic acid and its lactone in February. Definite seasonal variations were found in the patterns of free amino acids and of amino acid composition of proteins. (Jones-Wisconsin)

STATISTICAL ANALYSES USED IN THE COM-PARISON OF THREE METHODS OF FRESH-WATER ZOOPLANKTON SAMPLING, Kongelige Norske Videnskabers Selskab, Trond-

heim. Museet. A. Langeland, and S. Rognerud. Archiv fur Hydrobiologie, Vol 73, No 3, p 403-410, 1974. 4 fig, 3 tab, 12 ref.

Descriptors: *Statistical methods, *Sampling, *Zooplankton, Distribution patterns, Methodolo-

Identifiers: Schindler sampler, Clarke-Bumpus sampler, Friedinger sampler, Poisson sampler.

A plankton investigation was carried out in four lakes with different densities of phytoplankton and zooplankton to describe the distribution pattern and make an estimation of the sampling error. In two of the lakes algal blooms caused dense clogging of the nets. Random sampling was performed using the Schindler, Clarke-Bumpus and Friedinger samplers at the same time and at a given depth in the limnetic zone. Most of the samseries deviated significantly from the Poisson model and showed a different degree of over-dispersion (negative binomial). The majority of the calculated population characteristic lay between 0.02 and 0.2. When the series were compared, the

value of calculated population characteristic seemed to be independent of the methods used and of the environment. It is at least theoretically possible for the calculated population characteristic to remain constant for different sets of samples from the same population, regardless of the size of the sampling unit. No significant difference was found between the Schindler and Clarke-Bumpus samplers, but there was a distinct difference between the Schindler and Friedinger samplers. Daphnia spp. and Eudiaptomus gracilis were underestimated by the Friedinger sampler. (Jones-Wisconsin) W75-00688

UPTAKE MECHANISMS: INORGANIC AND ORGANIC

Bergen Univ. (Norway). Botanical Lab. P. Nissen.

Annual Review of Plant Physiology, Vol 23, p 53-79, 1974. 4 fig, 2 tab, 192 ref

Descriptors: *Plant physiology, *Nutrients, *Absorption, Kinetics, Inorganic compounds, Organic compounds, Model studies, Algae, Leaves, Root systems, Cations, Plant tissues, Ions.

Models and interpretations of multiphasic mechanisms of phosphate, sulfate, mineral cations, chloride, and boric acid for higher plants, in-cluding Elodea densa and Chlorella sp., are reviewed. Diffusion across the plasmalemma is discussed. The multiphasic series model seems consistent with all observations, but models of this type do have certain inherent limitations. Several other models and interpretations have been proposed. It is generally agreed that calcium ion is important for the structural integrity of cell membranes, as borne out by an examination of its ef-fect on multiphasic uptake patterns. The role of ATPases in ion transport remains controversial but good correlative evidence for the involvement of membrane-bound monovalent ion-stimulated ATPses is now emerging. The multiphasic patterns are not only similar for various ions but are similar or identical for uptake and long-distance transport. Organic solutes uptake by higher plants has received relatively slight attention. Discussion centers on the few systems where kinetic data are available. The mechanisms are in part multiphasic, in part not. The uptake of sugars, amino acids, and choline sulfate is described. (Jones-Wisconsin)

ON THE FACTOR STRUCTURE OF WATER QUALITY, VEDEN LAADUN RAKENTEESTA, National Water Board of Finland, Helsinki. Research Inst.

R. Laaksonen Publication No 9, 1974, 37 p. 2 fig, 11 tab, 11 ref. English summary

Descriptors: *Water analysis, *Water quality, *Urbanization, Lakes, Conductivity, Oxygen, Mathematical studies, Color, Chemical properties, Carbon dioxide, Alkalinity, Hydrogen ion concentration, Potassium compounds, Suspended solids, Iron, Nitrogen, Phosphorus, Sodium, Chlorides, Sulfur, Magnesium, Silica. Identifiers: Finland.

This study is based on data relating to the middepth of the water column, collected at stations located in deeper areas of Finnish lakes. In an earlier study the monitoring stations, which numbered 158 in 1970, were arranged in five groups according to such properties as the mean conductivi-ty and oxygen concentration. Factor analysis was applied to each group with the aim of describing and comparing the water quality, or the factor structure and determining whether contents of the parameters and their relations to each other vary from one group to the other. In both sets of groups the value of oxygen, carbon dioxide, alkalinity and pH as indices of quality decreases with increasing human influence, being clearly greater at stations

that are close to their natural condition than at those that are far removed from it. The salt factor has not the highest eigen value in any of the conductivity groups, although it is the chief index of quality in the ungrouped material. The alkalinity factor gives the best indication of quality in the station groups representing the least disturbed waters and also best explains magnesium and silicon. (Jones-Wisconsin) W75-00691

BENTHAL SULFIDE RELEASE IN AQUATIC

SYSTEMS, Oregon State Univ., Corvallis. Department of Civil Engineering. For primary bibliographic entry see Field 5B.

QUANTITATIVE RELATIONS BETWEEN PHYTOPLANKTON AND THE POPULATION DYNAMICS OF THE ROTIFER BRACHIONUS CALYCIFLORUS PALLAS. RESULTS OF LABORATORY EXPERIMENTS AND FIELD STUDIES (QUANTITATIVE BEZIEHUNGEN ZWISCHEN PHYTOPLANKTON UND DER STUDIES (QUANTITATIVE BEZIEHUNGEN
ZWISCHEN PHYTOPLANKTON UND DER
POPULATIONSDYNAMIK DES ROTATORS
BRACHIONUS CALYCIFLORUS PALLAS.
BEFUNDE AUS LABORATORIUMS-EXPERIMENTEN UND FREILANDUNTERSUCHUN-GEN).

Frankfurt Univ. (West Germany). Fachbereich

Frantas Biologie.
U. Halbach, and G. Halbach-Keup.
Archiv fur Hydrobiologie, Vol 73, No 3, p 273-309, 1974. 12 fig, 10 tab, 112 ref. English abstract.

*Biological Phytoplankton, *Population, *Dynamics. *Rotifers, Chlorella, Biomass, Density, Filtration, Feeding rates, Fertility, Scenedesmus, Algal tox-

ins, Growth rates, Zooplankton.
Identifiers: *Brachionus calyciflorus, Chlorella
pyrenoidosa, Life span, Oocystis borgei,
Scenedesmus obliquus.

Experimental analysis of biotic interrelationships between the planktonic rotifer Brachionus calyciflorus and the unicelluar green alga Chlorella pyrenoidosa demonstrates two antagonistic in-fluences of the algae on the rotifers: a positive influence as food resource; a negative influence at high densities, e.g., by lowering the filtration rate. It is suggested that the latter effect is caused by toxic algal substances released into the medium by the algae. Model simulations demonstrate that the maximum of the intrinsic rate of natural increase due to the maxima of life span and fertility. Field studies were made by using 589 quantitative sam-ples of phyto- and zooplankton. Significant positive correlations were found between the egg ratio and the population growth rate on the one hand and dry weights of the green algae Oocystis borgei and Scenedesmus obliquus on the other hand. Best correlations were obtained by using the sum of both dry weights. In any limnetic community various positive and negative relationships exist not only between members of different trophic levels, but also between members of the same levels, such as competition. The importance of these interspecific relationships for understanding the community and its stability is discussed. (Jones-Wisconsin) W75-00707

MICROBIOLOGICAL PROCESSES OF THE PRODUCTION OF HYDROGEN SULFIDE IN THE REPNOE LAKE (SLAVIC LAKES), (IN

Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms. E. N. Chebotarev, V. M. Gorlenko, and V. I.

Kachalkin. Mikrobiologiya. Vol 42, No 3, p 537-541, 1973. Illus. English summary.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

Descriptors: *Hydrogen sulfide, Bacteria, Lakes, *Eutrophication, Water pollution effects. Identifiers: *USSR(Lake Repnoe).

The activity of microbiological processes of the production of H2S was studied in the salt myromictic lake Repnoe (USSR) (Slavic lakes group). Repnoe lake is a eutrophic reservoir. The rate of production of H2S was highest in the upper layer of ooze-15.6 mg H2S/kg wet ooze/day. The rate of bacterial sulfate reduction in water was much lower.--Copyright 1974, Biological Ab-

EFFECTS OF HANDLING ON OXYGEN REQUIREMENTS OF AMERICAN SHAD (ALOSA SAPIDISSIMA), Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.

Mark E. Chittenden, Jr.

J Fish Res Board Can. Vol 30, No 1, p 105-110,

Identifiers: Alosa-sapidissima, Micragion, *Mortality, *Oxygen, *Shad(American), *Fish

O2-Tolerance was determined 0.25, 3 and 24 hr after introducing young American shad (A. sapidissima) to washtubs 7, 4, 2, 5, 2 and 2 days after previous disturbance in the holding tank. Dissolved O2 at equilibrium loss and death varied from 1.1-8.0 and 0.9-5.7 mg/l, respectively; and from 1.1-8.0 and 0.9-5.7 mg/l, respectively; and mean O2 levels at equilibrium loss and death in the 3-hr X 2-days tests were 1.5-3 times higher than in any other handling combination. Present evidence indicates that the effects of handling American shad vary, with the intensity of excitement generated by handling seeming to determine whether the fish lives, dies immediately or dies later. This phenomena is robably responsible. later. This phenomenon is probably responsible for difficulty in transporting and marking this species and for conflicting reports on O2 requirements and salinity and low temperature tolerance. Mean O2 levels with 99% confidence limits at equilibrium loss and death of unexcited individuals were 1.62 plus or minus 0.13 and 1.28 plus or minus 0.19 mg/l, respectively. Virtually no individuals lost equilibrium or died until O2 declined to 2.56 and 1.92 mg/l, respectively. Nearly all lost equilibrium or died at 0.68 and 0.64 mg/l, respectively. Field and laboratory evidence suggests that minimum daily O2 levels of 2.5-3.0 mg/l permit migration through polluted areas, but 4.0 mg/l ap-pears necessary in spawning areas.—Copyright 1973, Biological Abstracts, Inc.

GROWTH AND MORTALITY IN AN ARCTIC INTERTIDAL POPULATION OF MACOMA BALTHICA (PELECYPODA, TELLINIDAE), Manitoba Univ., Winnipeg. Dept. of Zoology.

Roger H. Green. J Fish Res Board Can. Vol 30, No 9, p 1345-1348, 1973. Illus.

Identifiers: *Arctic, Bays, *Canada(Hudson Bay), Food, *Growth, *Macoma-balthica, *Mortality, Pelecypoda, Summer, Tellinidae, Temperature, Tidal levels.

In an arctic intertidal environment on Hudson Bay (Canada), Macoma balthica have a higher growth rate at a tidal level of i.1 m above mean low than at the mean low water level, in terms of both length and dry weight. Temperature, rather than food, appears to be the primary proximate factor involved and summer air temperatures play a major role. The estimated growth rates are com-parable to reported growth rates for intertidal Macoma populations in Scotland and the Netherlands. A partial life table calculated from the death assemblage indicated that Macoma at 1.1 m above assemblage indicated that was om a 1.1 m above mean low water have an annual mortality which in-creases from about 20% at age 2 to about 50% at age 7 yr.--Copyright 1974, Biological Abstracts, Inc. W75-00788 BURGESS V. M/V TAMANO (PROCEEDINGS ON MOTION TO DISMISS SUITS SEEKING DAMAGES AS A RESULT OF OIL SPILLAGE). For primary bibliographic entry see Field 6E. W75-00953

DETERMINATION OF DETERMINATION OF A NITROGEN-PHOSPHORUS BUDGET FOR BAYOU TEXAR, PENSACOLA, FLORIDA, University of West Florida, Pensacola. Dept. of

Biology. G. A. Moshiri.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 292, \$4.75 in paper copy, \$2.25 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No 29, July 15, 1974. 82 p, 7 fig, 7 tab, 2 append. OWRT B-016-FLA(1), OWRT B-019-FLA(1). 14-31-0001-3869, 14-31-0001-4069

Descriptors: *Bayous, *Eutrophication, Nitrifica-tion, Nitrates, *Nitrogen, Ammonia, *Phosphorus, Phosphates, Phytoplankton, Primary productivity, Water quality, Sediments, Enachment, Storm water, Runoff, Circulation, ation, Sewage, Oxygen, Stratification, Oxygen, Siltation, Sewage, *Florida, *Estuaries.

Identifiers: Heterotrophic productivity, *Bayou

The extent of nitrogen and phosphorus inputs and the extent of nitrogen and phosphorus inputs and their effects on algal productivity in Bayou Texar, Pensacola, Escambia County, Florida, has been under investigation since June, 1971. To date results indicate that there are numerous sources of nutrients into the Bayou, of which Carpenter's Creek and storm water runoff are the major con-tributors. Other sources are runoff from fertilizers applied to lawns, overflow of inadequate sewer lines, and to a much lesser extent, from sources such as rainwater and encroaching Pensacola Bay waters. Ecologically, the Bayou is approaching eutrophication as is evidenced to highly fluctuating oxygen and primary productivity patterns well correlated with algal cell numbers and distribution. Recommendations made for the improvement of water quality in the Bayou include (1) Improvement of circulation by the construction of a new channel, (2) Improvement of storm water and sewage facilities, (3) Improvements in the Car sewage facilities, (5) improvements in the Car-penter's Creek channel to alleviate erosion, and (4) Selected dredging in areas of heavy siltation in the Bayou in order to improve flushing and circulation. (Morgan-Florida) W75-00976

MICROORGANISMS CAPABLE OF DEGRAD-ING REFRACTORY HYDROCARBONS IN OHIO WATERS,

Dayton Univ., Ohio. Dept. of Biology.

Joseph J. Cooney Available from the National Technical Informa-Available from the National Technical information Service, Springfield, Va. 22161, as PB-237 293, \$3.75 in paper copy, \$2.25 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 443X, August 1974. 39 p, 4 fig. 13 tab, 41 ref. OWRT A-029-OHIO(1). 14-31-0001-4035.

Descriptors: *Organic compounds, Freshwater, *Microorganisms, *Water pollution sources, *Oil pollution, Oil wastes, Aquatic bacteria, Aquatic fungi, Bacteria, Fungi, Yeasts, Sediments, *Biodegradation, Water pollution effects, *Ohio. Identifiers: Aromatic hydrocarbons, Paraffinic hydrocarbons, Olefinic hydrocarbons, Hydrocar-bon-using bacteria, Hydrocarbon-using fungi, Hydrocarbon-using yeasts.

Four freshwater ecosystems in Ohio were sampled over a two-year period for content of hydrocar-bons, for total bacterial and fungal populations and for numbers of hydrocarbon-using bacteria, yeasts, and filamentous fungi. The persistent hydrocarbons in each system are associated with bottom samples rather than with the water column. Aromatic, olefinic and paraffinic hydrocarbons all persist in sediments, but olefins are the largest class of persistent compounds. Linear regression analyses yielded data suggesting that a high con-tent of aromatic and/or olefinic hydrocarbons may be inhibitory or toxic to the microbial flora. The hydrocarbon content of sediments does not inhibit or enhance the numbers of heterotrophic microorganisms, and numbers of bacteria, yeasts and filamentous fungi vary together; sediments which contain more hydrocarbon contain more hydrocarcontain more hydrocarbon contain more hydrocarbon-using microorganisms. Hydrocarbon-using microorganisms comprise 0.1% or less of the total population of aerobic microorganisms. More hydrocarbon-using bacteria are present than yeasts and filamentous fungi but the relative biomasses may be more nearly equal. Moreover, numbers of hydrocarbon-using bacteria correlate with the numbers of hydrocarbon-using yeasts and fungi indicating that both groups are important in hydrocarbon-polluted systems. A collection of 350 representative organisms has been isolated. W75-00977

A MODEL FOR SIMULATING RIVER AND RESERVOIR TEMPERATURES WITH APPLICATIONS FOR ANADROMOUS FISH MANAGEMENT,

Oregon State Univ., Corvallis. Dept. of Civil Engineering.

J. W. Currie, A. N. Halter, and R. D. Layton Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-237 280, \$7.25 in paper copy, \$2.25 in microfiche.
Oregon Water Resources Research Institutes, Corvallis, Completion Report No WRRI-26, September 1974. 195 p, 42 fig, 11 tab, 31 ref, append. OWRT A-024-ORE(1).

Descriptors: Model studies, *Simulation analysis, Hydrology, Rivers, Reservoirs, Thermal pollu-tion, *Fish management, Pacific Northwest US, Planning, *Oregon, *Water temperature, Economics, Benefits, *Salmon, Forecasting. Identifiers: *Anadromous fish, Pacific salmon, *Holley project(Calapooia River).

problem confronting the Corps of Engineers and other water resources planners in the Pacific Northwest is the prediction of anadromous fish enhancement benefits that would result from a proposed high dam project. These benefits are exproject from augmenting natural streamflows with relatively cold reservoir withdrawals. The result-ing increased streamflows and decreased river temperatures downstream are expected to sustain larger salmon populations than would occur without an impoundment. The objectives of this study are to develop a computer simulation model for continuously predicting reservoir and downstream temperatures and mass flows for a single high dam system; and to demonstrate how the model could be used in an actual planning situation to provide information on anadromous fish production. It was found that the river temperatures downstream from the proposed reservoir could not be maintained within the optimum range for Pacific salmon. Further, the tempera-tures of the reservoir withdrawals would have a negligible effect upon river temperatures beyond 24 miles downstream from the dam site. An economic analysis suggests that the level of anadromous fish enhancement and recreation benefits predicted by the Corps of Engineers could not be achieved by constructing the proposed Holley project. W75-00978

REHABILITATION OF STREAMS RECEIVING

REHABILITATION OF STREAMS RECEIVING ACID MINE DRAINAGE, Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies. E. E. Herricks, and J. Cairns, Jr. Available from NTIS, Springfield, Va. 22161, as PB-237 268. Supplementary data (224p) available from Microfiche Publications, 305 E. 46th St, New

Effects Of Pollution—Group 5C

York, N.Y., 10017, ASIS/NAPS Doc. No. 02256. Virginia Water Resources Research Center, Blacksburg, Bulletin 66, (1974). 284 p, 15 fig, 14 tab, 65 ref, 2 append. OWRT B-034-Va(6).

Descriptors: Mine drainage, Reclaimed water, Water pollution treatment, Acid mine water, Strip mines, Model studies, Water pollution effects, Aquatic drift, Water pollution control, Benthos, Stream improvement, Effluent streams. Identifiers: Baetis sp.

The effects of short term low pH and long term acid mine drainage (AMD) stress were studied in relation to recovery and restoration of aquatic macrobenthic communities. Experimental acid additions were made to a healthy productive stream, reducing pH from 8.0 to 4.0 for 15 minutes. Diversity and density were decreased. Recovery was related to downstream defit of lated to downstream drift of recolonizing organissued to downstream drift of recolonizing organ-issues; full recovery occurred within 19 to 28 days with density and diversity equaling pre-stress values. A second study was made to observe drift-borne recolonizing organisms. Baetis sp. dominated drift collections, and was most abun-dant in bottom fauna collections indicating a relationship between drift and section recovery.

Average drift intensity was 10 organisms or less during one 15-minute drift sample; drift rates were calculated to be in excess of 5000 organisms/day.

CONCENTRATIONS OF METAL IONS IN MEL-

BOURNE'S RIVERS, La Trobe Univ., Bundoora (Australia). Dept. of Chemistry. For primary bibliographic entry see Field 5B. W75-01009

ACUTE EFFECTS OF AROCLOR (TRADE MARK) 1254 (PCB) ON ICTALURUS PUNCTATUS (CATFISH),
Texas A and M Univ., College Station. Dept. of
Veterinary Physiology and Pharmacology.

B. J. Camp, E. Hejtmancik, C. Armour, and D. H.

Bulletin of Environmental Contamination and Toxicology, Vol 12, No 2, p 204-208, August 1974. 3 tab, 7 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, *Catfish, *Absorption, Bioassay, Laboratory tests, Biochemistry, Fish physiology, Sodium, Potassium, *Toxicity, Water pollution effects.

Identifiers: Tissue analysis, Blood, Serum transaminase, Liver, Brain, Nervous tissue, Bioaccumulation.

The uptake and tissue distribution of PCBs were measured and changes in specific biochemical constituents were observed in catfish exposed to Aroclor (Trade mark) 1254. Blood and tissue samples were collected for analysis. Serum protein, sodium and potassium levels, serum cortisol and transaminase were all investigated by various techniques. Accumulation of PCBs by the brain, liver and skeletal tissue was rapid and increased markedly with time. The greatest biological magnification occurred with liver (greater than 300X). (Katz) W75-01017

THE EFFECTS OF ZINC ON RAINBOW TROUT (SALMO GAIRDNERI) IN HARD AND SOFT

WATER, Colorado Div. of Wildlife, Denver. J. R. Sinley, J. P. Goetti, and P. H. Davies. Bulletin of Environmental Contamination and Toxicology, Vol 12, No 2, p 193-201, August 1974. 4 tab, 21 ref.

Descriptors: *Mortality, *Zinc, *Rainbow trout, *Growth rate, *Reproduction, Hardness(Water), *Bioassay, *Lethal limit, Salmonids, Resistance,

Juvenile fish, Water quality control, Standards, Spawning, Water pollution effects.

Identifiers: TL50, Sublethal effects, MATC,

Acute bioassays to determine the TL50 of zinc for rainbow trout were performed. Sublethal effects on growth, reproductive capacity, spawning behavior and viability of eggs were monitored. The results were expressed as maximum acceptable toxicant concentrations or MATC. Survival of fish from eggs and fry acclimated to sub-lethal concentrations was compared with survival of non-accli-mated fish. The 96 hr TL50 values for juvenile rainbow trout in hard and soft water at 15C were 7210 and 430 mg/liter. Death of juvenile fish was determined to be the most sensitive criterion for establishing MATC values. (Katz)

A NUMERICAL STUDY OF THE CONCENTRA-TION OF SOME HEAVY METALS IN TASMANIAN OYSTERS, Commonwealth Scientific and Industrial Research

Organization, Hobart (Australia). Tasmanian Re-

gional Lab. D. A. Ratkowsky, S. J. Thrower, I. J. Eustace, and

J. Olley.

Journal of the Fisheries Research Board of Canada, Vol 31, No 7, p 1165-1171, July 1974.

Descriptors: *Oysters, *Heavy metals, *Zinc, *Cadmium, *Copper, Water pollution effects, Domestic wastes, Industrial wastes, Bioindicators, Absorption, Sampling, Analytical techniques, *Australia, Pollutant identification. Identifiers: Coordinate analysis, Bioconcentration, Crassostrea ssp, *Tasmania.

Inferential techniques of numerical classification and principal coordinate analysis have been used to interpret data obtained on the Zn, Cd and Cu concentrations of 48 samples of oysters, comprising 473 individuals, grown at a variety of places around the Tasmanian coastline. A close association was obtained between proximity to heavily ur-banized areas and concentration of metals found, oysters growing nearest urban areas having the highest concentrations of one or more of the metals. It appears that areas for commercial ovster growing should be sought in regions far from centers of urbanization and industrialization. Examination of samples of native oysters could be useful in providing an index or measure of environmental pollution. (Katz) W75-01020

BENDS IN FISH,

Virginia Mason Research Center, Seattle, Wash. B. G. D'Aoust, and L. S. Smith. Comparative Biochemistry and Physiology, Vol 49A, p 311-321, 1974. 1 tab, 2 fig, 35 ref.

Descriptors: *Supersaturation, *Nitrogen, *Salmonids, *Fry, Gases, Rainbow trout, Salmon, Descriptors: Fishkill, Microscopy, Methodology, Assay, Bub-bles, *Bioassay, Diffusion, Water pollution ef-

Identifiers: *Bends(Fish), Bubble formation, Histology, Decompression.

Fish mortality due to low-level nitrogen supersaturation in natural waters (as little as 15 percent) raises the question of their sensitivity to decom-pression-induced divers bends. Fingerling salmonids have been saturated with air, and normoxic helium and argon at a range of initial pressures up to 6 atm, and then decompressed through a range of initial/final pressure ratios as high as 8.0. The results clearly show marked differences in bends-producing potential of these different gases with formation of histologically demonstrated tis-sue bubbles and emphasize the unsuitability of either excess partial pressure or relative decom-pression as predictive indices of decompression stress. The results indicate that experimental

determination of the critical conditions for bubble formation in blood and tissues in vivo may be possible with such material to a precision not possible in mammalian studies. (Katz) W75-01021

RESISTANCE TO OXYGEN DEFICIENCY IN MARINE BOTTOM INVERTEBRATES OF THE WESTERN BALTIC SEA, (SAUERSTOFFMANGELRESISTENZ MARINER BODENVERTEBRATEN AUS DER WEST-LICHEN OSTSEE), Kiel Univ. (West Germany). Institut fuer

Meereskunde.

R. R. Dries, and H. Theede. Marine Biology, Vol 25, No 4, p 327-333, 1974. 6 fig. 24 ref.

fauna, Respirat *Benthic Descriptors: Oxygen. *Invertebrates, *Temperature, Respiration, *Oxygen requirements, Animal physiology, Sediments, Movement, Resistance, Dissolved oxygen, Water pollution effects.

Identifiers: *Temporary anoxia, Mobility, *Baltic

Among the macrobenthos fauna of the Western Baltic Sea, lamellibranchs occurring in poorly oxygenated soft sediments exhibit especially tolerances to temporary oxygen deficiency. Such tolerance is less well developed in mobile species of various systematic groups than in more or less immobile forms. Commonly, tolerance to oxygen deficiency tends to increase with decreasing temperature. Different qualitative relations between tolerance to oxygen deficiency and temperature may be correlated with the distributional range of the species. (Katz) W75-01022

THE INCORPORATION OF TRITIUM IN THE BODY WATER AND ORGANIC MATTER OF SELECTED MARINE INVERTEBRATES,

California Univ., Livermore. Lawrence Livermore Lab. J. S. Tucker, and F. L. Harrison.

Comparative Biochemistry and Physiology, Vol 49A, p 387-397, 1974. 2 tab, 4 fig, 17 ref.

Descriptors: *Marine animals, *Invertebrates, *Tritium, *Hydrogen, *Clams, *Crabs, *Oysters, Methodology, Organic matter, Water pollution ef-

Identifiers: Mya arenaria, Cancer productus, Crassostrea gigas, Tissue studies, Muscle, Viscera, Tritium turnover.

Maximum turnover rate constants determined for body water hydrogen were 1.4/hr. in Mya arenaria, 1.5/hr. in Crassostrea gigas and 2.1/hr. in Cancer productus. Turnover rates in the rapidly exchangeable compartment of the tissue-bound hydrogen of clam viscera and muscle tissue showed little difference; the maximum rate constant was 1.4/hr. In the viscera about 26 percent of the tissue-bound hydrogen was exchangeable and in the muscle about 22 percent. Higher average turnover rates were observed for bivalves when food organisms were present in the water. (Katz) W75-01023

SOME EFFECT OF DREDGING ON POPULA-TIONS OF MACROBENTHIC ORGANISMS, Hofstra Univ., Hempstead, N.Y. Dept. of Biology. E. H. Kaplan, J. R. Welker, and M. G. Kraus. Fishery Bulletin, Vol 72, No 2, p 445-484, April 1974. 20 tab, 13 fig, 71 ref.

Descriptors: *Dredging, *Benthic fauna, Hydrography, *Biomass, Environmental effects, Channel improvement, Benthos, Sediments, Clams, Aquatic populations, Bottom sampling, Methodology, Nutrients, Analytical techniques, Statistical models, Standing crops, Productivity, Turbidity, *New York, Water pollution effects.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

Identifiers: *Mercenaria mercenaria, Nereis ssp. *Goose Creek(New York).

Populations of epi- and infauna were studied from 10 months before to 11 months after a navigation channel was dredged through a small, shallow lagoon. A new sampler which penetrated 20-30 cm. into the substratum was used. Values of certain particulate and dissolved nutrients changed after dredging, but no correlation was observed between animal populations and fluctuations in nutrients. Significant reductions in standing crop figures and species and specimen numbers oc-curred in both the bay and the dredged channel. Mercenaria mercenaria population were reduced, but there was no evidence of mass mortality. Recovery of biomass in the channel was affected by sediment composition, but seasonal and sediment type variations were not significant in the bay as a whole. Productivity of Goose Creek was calculated at 89.87 g/sq m/yr before dredging and 31.18 g/sq m/yr after dredging. Productivity figures for the mixed peripheral marsh were calculated and the annual loss due to replacement of 10.87 ha of marsh by spoil areas was estimated at 49,487 kg. The unusually profound effects of dredging reported for Goose Creek are attributed to its small size and shallowness. (Katz) W75-01024

THE INFLUENCE OF CHANGES IN OXYGEN TENSION ON THE HEMATOCRIT VALUE OF BLOOD SAMPLES FROM ASPHYXIC RAIN-BOW TROUT (SALMO GAIRDNERI),

Helsinki Univ. (Finland) Dept. of Zoology. A. Soivo, K. Westman, and K. Nyholm. Aquaculture, Vol 3, No 4, p 395-401, August 1974. 1 tab, 1 fig, 12 ref.

Descriptors: *Oxygen, *Rainbow trout, Methodology, Spectrophotometry, Biochemistry, Fish physiology, Oxygen sag, Environmental effects, Water pollution effects.

Identifiers: *Oxygen tension, *Hematocrit, *Blood chemistry, Asphyxic conditions, Erythro-

Changes in hematocrit values were studied in vitro in blood samples of asphyxic rainbow trout treated under reduced oxygen tension and with oxygen. The hematocrit value of blood kept under reduced oxygen teamson increased by only about 5% during the first hour. When blood samples were ox-ygenated, their hematocrit value decreased by about 11% during the first hour. The mean corpuscular haemoglobin concentration (MCHC) value obtained for the blood directly after sampling showed that the cells were swollen in vivo. The causes of cellular swelling are discussed. (Katz) W75-01025

VARIATIONS IN THE ZINC, COPPER, MAN-GANESE AND LEAD CONTENT OF BALANUS BALANOIDES IN CARDIGAN BAY, WALES, University Coll. of Wales, Aberystwyth. Dept. of

M. P. Ireland. Environmental Pollution, Vol 7, No 1, p 65-75, July 1974. 3 tab, 5 fig, 16 ref.

Descriptors: *Zinc, *Copper, *Manganese, *Lead, *Primary productivity, *Phytoplankton, Metals, Heavy metals, Seasonal, Absorption, Growth Heavy metals, Seasonal, Absorption, Growin rate, Methodology, Spectrophotometry, Reproduction, Water pollution effects. Identifiers: Balanus balanoides, Bioaccumulation, Tissue analysis, Eggs, *Barnacles, *United King-dom(Cardigan Bay-Wales).

A study was made of the concentration of zinc, copper, manganese and lead in Balanus balanoides taken at different times of the year but at two en-vironmentally similar sites. Zinc occurred in the highest concentrations at all times of the year and at both sites. The highest concentration of all four metals was found at the southerly site. The lowest levels of zinc and copper at the northerly site were found in the summer months, and those of zinc. manganese and lead at the southerly site in March 1973. The distribution of metals at the two sites is discussed in relation to river flow rates and tidal flow, together with phytoplankton productivity. A possible effect on growth and fecundity is discussed (Katz)

THE EFFECT OF CHLORINATING
HYDROCOOLING WATER ON MONILINIA
FRUCTICOLA CONIDIA AND BROWN ROT,
Agricultural Research Service, Fresno, Calif. Horticultural Crops Marketing Lab.

D. J. Phillips, and J. Grendahl. Plant Dis Rep. Vol 57, No 10, p 814-816. 1973.

Identifiers: *Brown rot, *Chlorinating hydrocooling water, Chlorites, Conidia, Cooling water, *Monilinia-fructicola, Temperature, Water pollution effects, Toxicity, Fruit, Peach Fungicides, Sodium hypochlorite, Nectarines.

With sodium hypochlorite as a source, the fungicidal effectiveness of hypochlorous acid at 0-25C on M fructicola conidia was studied. The tox-city of 3 and 5 ppm ClO(-) at pH 6.8 increased with temperature. One ppm ClO(-) was not toxic, and 10 ppm was toxic at all temperatures. Brown rot of peaches and nectarines inoculated with dry conidia was reduced in 50 and 100 ppm ClO(-) when treated for 20 min in solutions held at 0-5 or 21-23C. Fruit treated with chlorinated or nonchlorinated water at 0-5C had slightly more brown rot than fruit treated at 21-23C.--Copyright 1975, Biological Abstracts, Inc.

STUDIES ON THE PHYTOPLANKTON ECOLO-GY OF THE TRONDHEIMSFJORD: III. DYNAMICS OF PHYTOPLANKTON BLOOMS IN RELATION TO ENVIRONMENTAL FAC-TORS, BIOASSAY EXPERIMENTS AND PARAMETERS FOR THE PHYSIOLOGICAL STATE OF THE POPULATIONS,

Trondheim Univ. (Norway). Biological Station. E. Sakshaug, and S. Mykiestad. J Exp Mar Biol Ecol. Vol 11, No 2, p 157-188.

1973. Illus. Identifiers: *Bioassay, Ca Diatoms, Metals, *Norway(Trondheimsfjord), Calanus-finmarchicus, Nitrates, Phosphates, *Phytoplankton, Silicates, *Eutrophication.

Quantitative phytoplankton sampling was carried out at weekly intervals at 1 station in the central part of the Trondheimsfjord (Norway) and at irregular intervals at one station near Trondheim harbor during March-Oct., 1970 and 1971. Stages of diatom blooms were related to variations in freshwater discharge, hydrography, nutrients (nitrate, orthophosphate and reactive silicate in sea water and river water), light, the results of bioassay experiments, parameters for the physiological state of natural phytoplankton populations, and data on phytoplankton and hydrography collected during 1963-1969. Two spring blooms of diatoms are persistent in the area. The first one starts in March, triggered by an increase in the incident radiation and culminates in early April. It develops analogously to a batch culture and is nourished mainly by nutrients accumulated during the winter. The 2nd takes place in brackish waters during May-June concomitant with floods in rivers. The magnitude of its populations cor-responds to discharge maxima unless disturbed by hydrographical irregularities and heavy grazing by Calanus finmarchicus (Gunnerus). This bloom is analogous to a continuous culture and is nourished by nutrients in entrainment water and to a lesser extent by those in the river water. The unpredicta-ble development of diatom blooms in the autumn seems to follow peaks in the discharge unless prevented by too low salinity and poor incident light. In autumns of little discharge and with turbu-lence in the upper 5-10 m dinoflagellates predominate. In high salinity waters N seems generally more limiting than P for phytoplankton growth. The N/P atomic ratio of such waters with no phytoplankton growth was 10-12 in contrast to 13-18 in the phytoplankton. Due to the high N/P ratio of 40-50 in river water, P was more limiting than N in some brackish waters. On 2 occasions trace metals seemed to be the most limiting. (See also W74-06545)--Copyright 1974, Biological Abstracts. Inc. W75-01059

THE FERTILIZATION OF GREAT CENTRAL LAKE: III. EFFECT ON JUVENILE SOCKEYE

SALMON,
Fisheries Research Board of Canada, Nanaimo
(British Columbia). Biological Station.
W. E. Barraclough, and D. Robinson.
US Natl Mar Fish Serv Fish Bull. Vol 70, No 1, p

37-48. 1972. Illus.

Identifiers: *Great Central Lake, British Columbia, *Canada, Feeding, *Fertilization, Growth, Ju-veniles, Lakes, Plankton, Primary production, Salmon, *Sockeye salmon, Zooplankton, *Eutrophication, Water pollution effects.

Nutrient levels and rates or primary production in nursery lakes are factors which may limit produc-tion of sockeye salmon. This paper describes the effect of artificial fertilization on feeding behavior and growth of juvenile sockeye salmon in Great Central Lake, Vancouver Island, British Columbia. Underyearling sockeye salmon grew 30% larger in 1970 than in 1969 as a result of adding 100 tons of fertilizer to Great Central Lake. The growth pattern for the whole population was com-plex, however, and the increase in size of juvenile sockeye was not as much as had been expected from the increase in quantity of their food organisms. The fact that the sockeye did not appear to appreciably crop the high epilemnetic concentrations of zooplankton during July and Aug. may have been partly due to avoidance of high temperatures by the fish. (See also W75-01062)--Copyright 1972, Biological Abstracts, Inc. W75-01064

EFFECTS OF DDT ON CATIONS IN THE HEPATOPANCREAS OF PENAEID SHRIMP, Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab. D. R. Nimmo, and R. R. Blackman.

Trans Am Fish Soc. Vol 101, No 3, p 547-549.

1972. Identifiers: *Cations, *DDT, Hepato, Pancreas, *Penaeid shrimp, Penaeus-aztecus, Penaeus-duorarum, Water pollution effects, Chlorinated hydrocarbon pesticides, *Bioassays, Pollutant identification, Toxicity.

Chlorinated hydrocarbon pesticides can alter con-centrations of cations in heptic tissue of animals. Two distinct symptoms of DDT poisoning in penaeid shrimp (Penaeus aztecus, P. duorarum) were observed. In acute bioassays (concentrations of 0.15 ppb or more), shrimp showed nervous impairment (tremors, hyperexcitability, and finally paralysis) which are characteristic of arthropods. In chronic tests, when less DDT was used, shrimp became lethargic, refused food, and finally died; but at no time were nervous disorders noted. Analyses of shrimp in all tests showed that shrimp accumulated more DDT in the hepatopancreas than in other organs. When living shrimp were exposed to DDT, concentrations of some cations in the hepatopancreas became depressed.--Copyright 1974, Biological Abstracts, Inc. W75-01068

PHYSICOCHEMICAL ASPECTS OF DEVELOPMENT OF PATHOLOGICAL PROCESSES IN CYPRINUS CARPIO L. FOL-LOWING SHARP DROPS OF TEMPERATURE

Waste Treatment Processes—Group 5D

AND OXYGEN CONTENT IN WATER AND IN-TOXICATION BY VARIOUS POISONS. (IN

RUSSIAN), Moscow State Univ. (USSR). V. I. Chernyshov, and M. M. Telitchenko. Vopr Ikhtiol, Vol 13, No 1, p 155-166, 1973, Illus.

Descriptors: *Carp, Toxins, Fish diseases, Water pollution effects, Oxygen.

The physicochemical mechanisms of adaptation of the carp to a varying environment (increase and decrease of temperature degree of aeration and presence of toxins of various origins and in various concentrations) were investigated. On the basis of the changes of the investigated variables (antioxidative activity of tissue lipids, qualitative and quantitative changes in tissues, accumulation and quantitative changes in ussues, accumulation of quinones and peroxides), nonenzymic processes of free-radical oxidation probably participate actively in the formation of the non-specific pathogenic background in the form of autotoxins (peroxides). The intensity of free-radical oxidation, the cause of accumulation of autotoxins (peroxides), probably affects the resistance of the organism to infectious diseases and its ability to adapt to environmental changes.--Copyright 1974, Biological Abstracts, Inc. W75-01075

THE DETERMINATION OF THE DAILY RATES OF PLANKTON PRIMARY PRODUC-TION: MODEL AND IN-SITU MEASUREMENTS

(IN GERMAN), Eidgenoessische Eidgenoessische Technische Hochschule, Kastienbaum (Switzerland). Hydrobiology Lab. R. Gaechter.

Schweiz Z Hydrol, Vol 34, No 2, p 211-244, 1972, Illus. English summary.

Descriptors: *Primary productivity, *Plankton, Lakes, Water pollution effects. Identifiers: *Switzerland(Lake Lucerne), Carbon-14 method.

The daily primary production in lake Lucerne (47 degrees N latitude (Switzerland) was determined at different depths at approximately monthly vals between 22 July 1969 and 8 May 1970, by summing up series of short term measurements made during each day, using the 14C method. Simultaneously irradiant energy and attenuation of light in the water was measured. It is shown that, considering the photosynthesis-light response the trophogenic layer of the lake can be assumed as homogenous only from mid-Oct. to the end of March. Different known models to estimate daily surface production rates are compared with direct measurements and a new numerical model is described which allows daily production as a func-tion of depth to be calculated. A method is presented which converts the production rate per unit of surface area measured during a standard exposure time to the daily production rate.--Copyright 1974, Biological Abstracts, Inc. W75-01077

DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM, Southeast Missouri State Univ., Cape Girardeau.

Southeast Missouri State Univ., Cape Ghardeas. Dept. of Biology.
R. G. Kullberg.
Am Midl Nat, Vol 91, No 2, p 271-281, 1974, Illus. Identifiers: *Aquatic macrophytes, Berula-erecta, Biomass, Chara-sp, *Distribution, Effluents, Elodea-canadensis, *Michigan, Nasturtium-officinale, Potamogeton-crispus, Potamogeton-budgus, Potamogeton-budgus. Sparganiumrotanogeton-perinatus, Potamogeton-epihydrus, Potamogeton-pertinatus, Sparganium-americanum, Streams, Turbidity, Veronica-can-nata, *Pulp wastes.

Cover, volume and dry weight of the aquatic macrophytes of Portage Creek in Kalamazoo Co., Michigan (USA), were studied. Two series of water analyses 4 yr apart were made for the length

of the stream. The stream began in an unpopulated, uncultivated area and flowed into an urban area where it received paper mill wastes, after which the aquatic macrophytes were completely absent. The 2nd series of analyses, made 1 yr after the cessation of paper mill effluents, showed a 10-fold reduction of turbidity in the polluted portion, suggesting that turbidity was the most probable cause for the absence of macrophytes in previous years. The substrate cover by macrophytes in the upstream unpolluted portion was 41%. On the basis of the total plant cover, the 2 dominant species were Potamogeton pectinatus (44%) and Spar-ganium americanum (18%). The portion of the water volume occupied 82.8% of the total plant water volume occupied 82.8% of the total plant volume (Nasturtium officinale, 25.4%; Potamogeton crispus, 22.0%; P. pectinatus, 18.4%; Elodea canadensis, 17.0%). The same species comprised 83.3% of the dry weight (E. canadensis, 23.7%; P. crispus, 21.8%; N. officinale, 19.9%; P. pectinatus, 18.5%). (Other species studied were: an unknown grass, Chara sp., Berula erecta, P. epihydrus, Veronica cannata).—Copyright 1974, Biological Abstracts, Inc. W75-01081

THE ECOLOGY OF THE DIATOMS OF THE KLIP RIVER, SOUTHERN TRANSVAAL, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Botany.

F. D. Hancock. Hydrobiologia, Vol 42, No 2/3, p 243-284, 1973,

Descriptors: *Diatoms, Hydrogen ion concentra-tion, Ecology, *Mine wastes, Nitrogen, Dissolved oxygen, Alkalinity. Identifiers: *South Africa(Klip River-So Transv).

Diatom associations formed by 2% or more of species, found by the Thomasson analysis method, are discussed in relation to the physical and chemical vicissitudes of a stream in which the head waters become cut off from those of the middle reaches by a barren zone caused by mineral and acid pollution from dumps resulting from the gold-mining industry on the Witwatersrand. Associations are found indicative of the originating waters, of regions of instability due to the pollution, whether it be its onset or recovery thereform of the lower recovered middle reaches. In each reach there are found to be associations in-dicative of pH, nitrogen content, dissolved oxygen and alkalinity. Thus the associations enable one to 'read' the conditions of the river. An additional association occurs at the very turbid mouth of the river which is indicative of low light requirement. The work supports the findings of other researche into the diatom ecology of South African streams.--Copyright 1974, Biological Abstracts, Inc. W75-01082

SINGLE AND CONTINUOUS EXPOSURE OF THE ADULT AMERICAN OYSTER, CRASSOS-TREA VIRGINICA, TO MARINE VIBRIOS, National Marine Fisheries Service, Oxford, Md. Middle Atlantic Coastal Fisheries Center.

Can J Microbiol, Vol 20, No 4, p 513-517, 1974,

Ildentifiers: *Bacteria(Marine), Crassostrea-vir-ginica, *Oysters, Vibrio-anguillarum, *Vibrio an-guillarum, Water pollution effects.

Adult American ovsters, C. virginica, were challenged by single and continuous exposure to high concentrations of vibrios and other bacteria repor-tedly pathogenic to aquatic animals. A reduction in microbial population in a test system containing oysters compared with an oyster-free control in-dicated that the mollusks were ingesting or otherwise clearing the bacteria. Oysters exposed to I strain of Vibrio anguillarum experienced higher mortalities than those exposed to the other test organisms, but in no case did mortalities approach those previously found in similarly challenged lar-

val bivalve mollusks. These bacteria appear to be of marginal significance as primary pathogens of adult American oysters.--Copyright 1974, Biological Abstracts, Inc. W75-01090

EFFECT OF FERTILIZERS ON HUMAN EN-VIRONMENT IN BULGARIA, Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Soil Science. I. Garbouchev, and N. Mitreva. Qual Plant Mater Veg, Vol 22, No 1, p 55-64, 1972,

Descriptors: *Potable water, *Nitrates, *Fertilizers, Lettuce, Corn, Plant tissues, Public Descriptors:

Identifiers: *Bulgaria, Environment, Forage.

The effect of fertilizer use in the recent 10 yr on the quality of drinking water was examined. Results are given from some experiments on the overcoming of nitrate accumulation in plant tissues of lettuce and forage maize. Balanced nutrition decreased nitrate content in the plants .-- Copyright 1974, Biological Abstracts, Inc. W75-01093

5D. Waste Treatment Processes

STUDIES ON THE VARIATION OF RIVER WATER WITH TREATMENT OF NATURAL POISONOUS ACID WATER, (IN JAPANESE), T. Iriye.

Bulletin of Yamagata University, Natural Science, Vol 8, No 1, p 69-84, January, 1972. 11 fig, 2 tab, 17 ref. (English summary).

Descriptors: *Rivers, *Water quality control, *Acidity, Mines, Agriculture, Fisheries, Permeation, *Hydrogen ion concentration, *Waste water treatment. Identifiers: *Japan, Treatment methods.

Many rivers in Japan are acidified by natural strongly acidic water (or so-called poisonous acid water). These rivers influence the quality of sur-rounding fisheries and agriculture. One method of treatment of the acid water is permeation through borings. In Matsu-kawa, which was affected by acid water from Nishiazuma mine, this method worked for several years, but the effect suddenly decreased and the water now has a pH of 4. This method of treatment was also tried in Zaogawa, Kaminoyama City without much improvement. (Prague-FIRL) W75-00598

PROCESS FOR PURIFYING WATER CONTAINING OILS AND SOLIDS, D. K. Beavon.

Canadian Patent 945,479. Issued April 16, 1974. Patent Office Record, Vol 102, No 16, p 1356, April. 1974.

Descriptors: *Patents, *Oil wastes, *Filter media, Sands, *Separation techniques, Gravity, *Waste water treatment.

Identifiers: *Backwashing, Particulate solids, Clarification.

Water containing oil and particulate solids, such as oil-wet solids, is filtered through a filter media, such as a sand for purification. Particulate solids are retained, thus yielding clear water or a mixture of solids-free oil and water, which will readily separate by gravity. The filter media is periodically regenerated by steam stripping to remove retained oil. It is then backwashed to remove oil-free par-ticulate solids. (Prague-FIRL) W75-00603

FLUID FILTERING DEVICE, Parker-Hannifin Corp., Cleveland, Ohio.

Group 5D-Waste Treatment Processes

C. A. Brown, and J. F. Thomas. Canadian Patent 948,562. Issued June 4, 1974. Patent Office Record, Vol 102, No 23, p 23-46, June, 1974.

Descriptors: *Patents, *Filtering, Equipment, Fluids, Valves, *Waste water treatment.
Identifiers: *Fluid filtering device, Filter elements.

A fluid filtering device has a housing with a cavity in which a cylindrical filter element is disposed. This defines an annular chamber between the outer wall of the filter element and the interior of the housing, the annular chamber registering with an inlet port. One end of the filter element registers with an outlet port so that the normal path of fluid flow is from the inlet port into the annular chamber, radially through the walls of the filter element, axially through the interior of the filter element and externally of the filtering device by the outlet port. When the filter element becomes clogged by a predetermined amount, a valve mechanism disposed at the opposite end of the filter element causes the fluid to bypass the filter element. The valve mechanism includes a cover member which in turn closes the housing cavity. Indicators are connected to the valve mechanism for determining the filtering condition of the filter element. (Prague-FIRL)

EJECTOR AERATED OXIDATION DITCH FOR

WASTE TREATMENT, Kimberly-Clark Corp., Neenah, Wis.

A.R. LeCompte. Canadian Patent 948,797. Issued June 4, 1974. Patent Office Record, Vol 102, No 23, p 23-97,

Descriptors: *Patents, *Oxidation lagoons, *Biochemical oxygen demand, *Suspended solids, Aqueous solutions, Aeration, Liquids, Equip-*Waste water treatment. Identifiers: *Ejectors, Oxidation ditch system.

An oxidation ditch system for the removal of BOD and suspended solids from aqueous waste involves the use of ejectors to aerate the liquid and to move the liquid around a closed-loop circuit. Advantages include reduced horsepower requirements and the use of deeper, high-volume ditches without reducing aeration effectiveness. (Prague-FIRL) W75-00605

FLOAT MOUNTED EJECTOR WASTE TREAT-MENT APPARATUS,

Kimberly-Clark Corp., Neenah, Wis. M. G. Mandt.

Canadian Patent 945,275. Issued April 9, 1974. Patent Office Record, Vol 102, No 15, p 1311, April, 1974.

Descriptors: *Patents, *Biochemical oxygen de-*Suspended solids, Aqueous solutions, Wastes, Piping, Maintenance, Aeration, *Waste water treatment.

Identifiers: *Venturi effect, *Floats.

A system is described for the removal of BOD and suspended solids from aqueous waste. It operates by the use of ejectors which are supported by a float. Advantages include improved mobility, reduced piping, and low maintenance requirements. In one such system a venturi effect is used to supply air to the ejectors place near the surface e aqueous waste to provide aeration. (Prague-FIRI.) W75-00606

SEWAGE TREATMENT UNIT, Pollution Control Systems Ltd, Thornhill

D. J. N. Light, and J. Devries. Canadian Patent 946,990. Issued May 7, 1974. Patent Office Record, Vol 102, No 19, p 19-94, May, 1974.

*Patents, Descriptors: *Patents, *Sewage treatment, *Aeration, *Storage tanks, Circulation, Floccula-*Sewage treatment, tion, Coagulation, Filtering, Suspended solids, Disposal, Bacteria, *Waste water treatment.

One treatment method for sewage involves aeratone treatment method for sewage involves aerating the raw sewage in a storage tank provided with means for recirculating the sewage and subsequently passing aerated sewage to a blending tank. There it is mixed with a flocculating or coagulating agent and the sewage is then passed to a filtering or clarifying assembly. This is provided in the assembly to receive the filtering medium described in the sewage is the passed to a filtering disposal and an outlet is received to subsequent disposal and an outlet is provided to dispense the filtrate. This filtrate may then be subjected to further aeration or bacteria removing treatment. (Prague-FIRL) W75-00607

METHOD AND APPARATUS FOR DENITRIFICATION OF TREATED SEWAGE,

Dravo Corp., Pittsburgh, Pa.

Elton S. Savage. Canadian Patent 947, 886. Issued May 21, 1974. Patent Office Record, Vol 102, No 21, p 21-93, May, 1974.

Descriptors: *Patents, *Denitrification, *Sewage treatment, *Activated sludge, Effluents, Nitrogen, Nitrates, Filters, Bacteria, Suspended solids, Clarification, *Waste water treatment. Identifiers: Deep bed filter, Settling zone

A method and apparatus are given for denitrification of aqueous nitrate-containing solutions. Specifically the invention provides for denitrification of the effluent from an activated sludge sewage treatment process. Effluent from the set-tling zone of such a process containing nitrogen compounds such as nitrates and nitrites, is passed through a deep bed filter. The filter medium has been inoculated with bacteria that convert the nitrogen compounds to nitrogen gas. The filter, in addition to removing the nitrogen compounds, removes any suspended solids from the settling zone effluent, so that the final effluent from the filter is concurrently clarified and denitrified. By controlling the backwash of the filter, bacteria are retained so as to enable continuous use of the filter for denitrification. (Prague-FIRL) W75-00608

REVERSE OSMOSIS WATER PURIFYING

Australian Patent 445,989. Issued March 7, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 8, p 794, March, 1974.

Descriptors: *Patents, *Water purification, *Reverse osmosis, Water supply, Water pressure, Equipment, Reservoirs, *Waste water treatment. Identifiers: Product water supply outlet, Treat-

A water purifying device includes a treatment chamber with a feed water inlet for connection to a source of water to be purified and a reverse osmo-sis water purifying element in this chamber, having a feed water outlet and a product water supply outlet. A reservoir has a compressible container whereby the inner volume of this container communicates with the product water supply outlet for storing product water and a transfer passage between the feed water outlet and the volume of the reservoir outside the compressible container. Means for selectively opening the transfer passa allow feed water pressure to be exerted on the product water, discharging product water through a product water discharge outlet. (Prague-FIRL) W75-00611

A PROCESS FOR PURIFYING WATER AND NATURAL HYDROCARBON GAS.
Australian Patent 446,481. Issued March 21, 1974.
Official Journal of Patents, Trade Marks and Designs, Vol 44, No 10, p 1014, March, 1974.

Descriptors: *Patents, *Water purification, Hydrates, *Waste water treatment, Separation techniques.

Identifiers: *Hydrocarbon gas, Feedstocks, Natural gas feedstock

A process for purifying water and natural hydrocarbon gas includes reacting an impure water feedstock with a natural gas feedstock to form solid hydrocarbon hydrates. Also described is an impure water residuum having an enhanced impurity content, which separates the solid hydrates from the water residuum, and washes the solid hydrates to remove adhered impurities. In addition, the washed hydrates are decomposed to form purified water and a purified gaseous hydrocarbon product. (Prague-FIRL)

TREATMENT OF BIOLOGICAL SLUDGE.

Australian Patent 446,556. Issued March 28, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 11, p 1079, March, 1974.

Descriptors: *Waste water treatment, Treatment facilities, *Patents, *Biological treatment, *Slurries, Sludge, *Sludge treatment, Aqueous solutions, Filtration, Evaporation, Recycling.

A method of treating an aqueous biological sludge is described. This comprises the steps of feeding the slurry through an evaporator plant where it is subjected to heat treatment and a part of its water content is removed by evaporation. The slurry which has passed through the evaporator plant is filtered, and the aqueous filtrate is recycled for further treatment with the slurry in the evaporator plant. (Prague-FIRL) W75-00613

TREATING A WATER STREAM CONTAINING

A WATER SOLUBLE SULFITE. Australian Patent 446,540. Issued March 21, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 10, p 1027, March 1974.

Descriptors: *Patents, *Waste water treatment, *Sulfites, Streams, Sulfur, Sulfates, Effluents, Hydrogen sulfide, Aqueous solution, *Water Identifiers: Water soluble sulfite.

A method for treating an input water stream con-taining a water soluble sulfite compound in order to reduce its total sulfur content while minimizing formation of sulfate by-products is comprised of three steps. First, the input water stream is contacted with a reducing agent selected from the group consisting of finely divided sulfur, a polysulfide compound, a water-soluble sulfide compound and mixtures at thiosulfate production conditions selected to form a thiosulfate-contain-ing effluent stream. Next the effluent stream from the previous step is reacted with carbon monoxide at reduction conditions selected to produce a sulfide-containing aqueous effluent stream to form a substantially sulfate-free treated water stream which is substantially reduced in total sulfur con-tent relative to the input water stream. (Prague-FIRL) W75-00615

REVERSE OSMOSIS BIBLIOGRAPHY: ABSTRACTED AND INDEXED,

Plastics Technical Evaluation Center, Dover, N.J. J. B. Titus

Available from NTIS, Springfield, Va., 22161, as AD-769 208, \$7.00 in paper copy, \$2.25 in microfiche. Plastec Report R45, June 1973. 176 p.

Descriptors: *Bibliographies, *Reverse osmosis, Water treatment, Waste water treatment, Recycling, Water reuse, Reclaimed water, Membrane processes, Semipermeable membranes, Desalination processes.

Waste Treatment Processes—Group 5D

A selected, abstracted and indexed bibliography on reverse osmosis is presented. The 669 works cited appeared within the 5-year period 1967-72. For guidance among the items cited, subject and author indexes are provided as well as a glossary of relevant terms and a list of companies and government agencies active in the field. This bibliography is arranged in alphabetical order by author for books and periodicals and by corporate author for reports and trade literature in date sequence from 1967 to 1973. (Knapp-USGS) W75-00616

GUIDELINES FOR DESIGNING PLANT SEWERS, Bissell, Merrill and Associates, Williamsville,

For primary bibliographic entry see Field 8A. W75-00710

TRICKLING FILTER VERSUS ACTIVATED SLUDGE: WHEN TO SELECT EACH PROCESS, Oklahoma State Univ., Stillwater. School of Civil

Engineering.
D. F. Kincannon, and J. H. Sherrard.
Water and Sewage Works, Vol 121, No 4, p 32-34,
36, April 30, 1974. 1 fig, 4 tab, 9 ref.

Descriptors: *Sewage treatment, *Waste water treatment, *Trickling filters, *Activated sludge, Biological treatment, Comparative analysis, Effluents, Operation ar formance, Methodology. and maintenance,

Secondary treatment of waste waters containing sectionary treatment of waste waters containing biodegradable organic matter usually requires a choice between the trickling filter process and the activated sludge process. An attempt is made to offer a reasonable basis for comparison of these two biological processes. Process similarities and differences are described, process modifications are discussed, and a criteria for process selection established. Results indicate that if activated sludge and trickling processes are compared on an equitable basis, effluent quality and operational characteristics are similar. Therefore, a rational selection procedure should be based on desired reatment objectives and then on economic and operational considerations. (Sandoski-FIRL) W75-00711

A FORMULA FOR AERATION TANK DETENTION TIME,

P. Sterling. Water and Sewage Works, Vol 121, No 5, p 62, May. 1974.

Descriptors: *Mathematical studies, Equations, Activated sludge, Design criteria, Operations, *Aeration, *Storage tanks, Flow, Biochemical ox-ygen demand, Loading, *Waste water treatment. Identifiers: *Detention time, Mixed liquor suspended solids.

A rational approach to elementary principles of design and operation of the conventional activated sludge process aeration tank, excluding oxygenation, is presented. It demonstrates that: flow is not tion, is presented. It demonstrates that: flow is not a factor in the determination of design aeration detention time; detention time varies directly as BOD concentration and inversely as the product of loading and mixed liquor suspended solids (MLSS) factors; and, the product of loading and MLSS factors may be used in direct ratio to determine relative system loading and/or percentage of design capacity utilized. (Sandoski-FIRL) W75-00714

FE WASTES HELP REMOVE PHOSPHATES. Canadian Chemical Processing, Vol 58, No 5, p 44-46, May, 1974. 3 fig.

*Waste Descriptors: water treatment. *Phosphates, *Industrial wastes, Coa *Iron, Aluminum, Costs, *Canada, Lime. Coagulation, Identifiers: Phosphate removal.

Environment Canada sponsored a study on available waste products that could be used for phosphate removal. Results indicate that both carbide lime and pickle liquor. or hentahydrate bide lime and pickle liquor, or heptahydrate crystals, consistently removed phosphates from sewage plant effluent, and at doses matching com-mercial iron and lime coagulants. Meanwhile, the Canada Centre for Inland Waters located in Burlington, Ontario, set up a joint venture with three Ontario municipalities which house metal processors with waste pickle liquor. For the cost of haulage, the liquor was taken to the town sewage plant where it was mixed with secondary effluent. Results to date are encouraging. Cur-rently lime, ferric chloride, and alum are the main coagulants for use in phosphate removal. Lime has coaguants for use in phosphate removar. Lime name produced worker opposition at sewage plants and is limited by pH specifications on released water. The Fe and Al salts generally are preferred with iron favored. Costs of the materials are computed. (Sandoski-FIRL) W75-00717

REMOVING MERCURY FROM WASTE BRINE.
Imperial Chemical Industries Ltd., London (England).

(Englanu). Australian Patent 446,563, Issued March 28, 1974, Official Journal of Patents, Trade Marks and Designs, Vol 44, No 11, p 1081, March 28, 1974.

Descriptors: *Patents, *Mercury, *Brines, Chemical precipitation, Chlorine, *Filtration, Sulfides, *Waste water treatment, Filters. Identifiers: Mercury removal.

A process for the removal of mercury from chlorine containing waste brine from a mercury cell is described. It comprises adding sulfide or hydrosulfide ions to the brine in sufficient amount to produce a redox potential of the brine, relative to a saturated KC1-Calomel electrode, a value to a saturated KC1-Catomet electrode, a value more negative than +0.45 volts whereby mercuric sulfide is precipitated. Also, the precipitated mercuric sulfide is removed by passing the brine through a filter which comprises at least two directly superimposed layers of granular filtration. material, the average size of the particles of granular material in the successive superimposed layers decreasing and the specific gravity of the granular material increasing from the top of the filter downwards. (Sandoski-FIRL)
W75-00719

SPINNING TOP FOR LIQUID AERATION, Shelston Waters, Sydney (Australia).

J. R. Kaelin. Australian Patent 445,817, Issued March 7, 1974, Official Journal of Patents, Trade Marks and Designs, Vol 44, No 8, p 752, March 7, 1974.

Descriptors: *Patents, Equipment, *Aeration, *Waste water treatment, Separation techniques, Identifiers: Spinning top, Liquids ventilation.

A vertical axis spinning top of internal blade type has been developed for the ventilation of liquids. It comprises a rotor member which diverges from a lower axial intake portion to an upper peripheral outlet portion. This rotor member has a number of blades to define a number of ducts for conveying the liquid to be ventilated from the intake portion to the outlet portion. Each duct has a longitudinal slot in the wall facing the inside of the spinning top which extends along the entire length of the duct. The slot has a width similar to the distance between consecutive blades at the intake end with the width of the slot being substantially constant along its length. (Sandoski-FIRL) W75-00720

DEEP TANK AERATION USING EDUCTOR TUBES OF ELONGATE CROSS-SECTION, Chicago Bridge and Iron Co., Aurora, Ill.

J. D. Walker.

Canadian Patent 946,991, Issued May 7, 1974, Patent Office Record, Vol 102, No 19, p 19-94, May 7, 1974.

Descriptors: *Patents, *Aeration, Equipment, *Sewage treatment, *Waste water treatment, Identifiers: Deep tanks, *Eductor tubes, Baffles.

Eductor tubes allow efficient aeration of huge quantities of sewage in very deep tanks. Air is liberated at only a moderate depth, the tubes ex-tend downwardly from only slightly above the level of liberation, and the tubes are elongated in horizontal cross-section for effective utilization of the full cross-section. There is a baffle at surface level above the tubes. (Sandoski-FIRL) W75-00721

AERATING LIQUIDS, Badische Anilin-and Soda-Fabrik A.G. Lud-wigshafen am Rhein (West Germany). R. Platz, W. Fuchs, and O. Nagel. Canadian Patent 947,639, Issued May 21, 1974, Patent Office Record, Vol 102, No 21, p 21-40, May 21, 1974

Descriptors: *Patents, *Aeration, Liquids, Equipment, Mixing, *Waste water treatment, Nozzles. Identifiers: Treatment methods, Mixing zone.

Aeration of liquids present in a container and premixing of the air to be introduced into the liquid is performed by means of a stream of liquid issuing from a nozzle into a mixing zone provided within the container with a portion of the liquid present in the container. Discharge into the remainder of the liquid follows. (Sandoski-FIRL) W75-00723

CORRELATION BETWEEN BIOCHEMICAL OXYGEN DEMAND (BOD) AND CHEMICAL OXYGEN DEMAND OF POTASSIUM DICHRO-MATE (CODCR) IN THE WASTE WATER FROM BOILED NOODLE (SPAGHETTI AND JAPANESE NOODLE), (IN JAPANESE), For primary bibliographic entry see Field 5A. W75-00724

SOLIDS THICKENING IN OXYGEN AC-

TIVATED SLUDGE,
Texas Univ., Austin. Dept. of Environmental
Health and Engineering.
R. E. Speece, and M. J. Humenick.
Journal of the Water Pollution Control Federation,

Vol 46, No 1, p 43-52, January, 1974. 9 fig, 2 tab, 6

Descriptors: *Activated sludge, Aeration, Suspended solids, Waste treatment, *Waste water treatment, Municipal wastes. Identifiers: *Oxygen activated sludge, *Mixed liquor suspended solids.

The solids thickening limitation, which exists when oxygen activated sludge is designed according to conventional air activated sludge principles, was analyzed. The mixed liquor suspended solids (MLSS) concentration characterizing the crossover point where the thickening function governs the area requirements of the final clarifier instead of clarification was defined. The increased capital costs for the aeration tank and final clarifier were demonstrated for municipal wastewaters in the region beyond the crossover point. A suggested design rationale was outlined to take advantage of some of the options inherent in commercial ox-ygen activated sludge. Solids separation can be ygen activated studge. Sould separation can be achieved within the aeration tank by confining the turbulence within the downflow bubble contact aerator (DBCA). The resulting relatively quiescent conditions within the sludge blanket permit clarifi-cation in the region above the sludge blanket recy-cle intake. Thus, solids separation can be achieved

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in an integrated aeration solids separation system. The thickening function and its inherent limitation are thereby eliminated, opening up the possibility of eliminating the final clarifier. Savings of 33 percent in capital cost are projected for an integrated aeration solids separation system over a conventional system. The process is patented. (Merritt-FIRL) W75-00726

PROTRACTED RECHARGE OF TREATED SEWAGE INTO SAND PART III--NUTRIENT TRANSPORT THROUGH THE SAND, Rensselaer Polytechnic Inst. Troy, N.Y For primary bibliographic entry see Field 5B. W75-00744

FACTORS AFFECTING LONGITUDINAL WATER TEMPERATURE DISTRIBUTION DOWNSTREAM FROM A POWER STATION, For primary bibliographic entry see Field 5B. W75-00762

EXPERIMENTAL STUDY ON THE NITROGEN CIRCULATION OF A BIOLOGICAL POND, Helsinki City Waterworks (Finland). H. Seppanen, and J. Hooli. Nordic Hydrology, Vol 5, No 2, p 119-128, 1974. 7

Descriptors: *Ammonification, *Nitrification, *Nitrogen cycle, *Waste water treatment, *Biological treatment, Microbial degradation, Ponds, Septic tanks, Sewage lagoons, Sewage bacteria, Laboratory tests, Ammonia, Enzymes, Chemical wastes. Identifiers: *Finland.

The ammonification and nitritation potentials of a biological pond in southern Finland were experimentally explored at the laboratory scale. The most important factor in evaluating the results of both ammonification and nitritation is the length of the lag phase. The length of the lag phase depends on the structure of the enzyme system of the microbial population and the density of the microbes active in the process concerned. The lag period for ammonification is considerably shorter than for nitrogen. Nitrogen reduction in biological than for nitrogen. Nitrogen reduction in biological ponds can be improved by determining the most favorable waste water concentrations for the biological circulation of nitrogen components through experimental potential determinations. The results indicated that both the ammonification and nitritation potentials depend on wastewater concentration. (Gibb-ISWS)

VOLUME OF STORM WATER RETENTION BASINS, Wayne State Univ., Detroit, Mich. Dept. of Civil

Engineering. C. J. Ordon

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE5, Proceedings Paper 10889, p 1165-1177, October 1974. 4 fig, 3 tab, 5 ref, 2 append.

Descriptors: *Rational formula, *Hydrograph analysis, *Storm water, *Retention, *Rainfall intensity, *Time of concentration, Design storm, Routing, Hydrologic data, Mathematical studies. Identifiers: *Colorado Urban Hydrograph Procedure, Retention basins.

Storm water retention basins are becoming a more frequent part of combined and separate storm water collection systems. A method for designing these basins was conceived, and a system of tables and calculations was developed to implement the design. The method described was compared with design, the method described was compared with the Colorado Urban Hydrograph Procedure (CUHP) currently used by some designers. Basic errors in CUHP were pointed out. The rainfall in-

tensity versus the time relationship was developed from a given rainfall versus duration relationship. The difference between the coefficient of runoff in the rational formula and the volume of runoff as a fraction of rainfall was explained. A discharge hydrograph can be routed through the retention basin by conventional means. (Singh-ISWS) W75-00776

PRETREATMENT GUIDELINES RELEASED

For primary bibliographic entry see Field 5G. W75-00936

WATER REGULATIONS--MARINE SANITA-TION DEVICE STANDARDS.
For primary bibliographic entry see Field 6E.
W75-00943

MATHEMATICAL AND OPERATIONAL RELA-TIONSHIPS FOR THE COMPLETELY MIXED ACTIVATED SLUDGE PROCESS. Oklahoma State Univ., Stillwater. School of Civil

Engineering.

J. H. Sherrard, E. D. Schroeder, and A. W.

Lawrence. Water and Sewage Works, Vol 121, No 4, p 84-86, 88, 91, April 30, 1974. 8 fig, 1 tab, 12 ref.

Descriptors: *Mathematical studies, *Activated sludge, Aerobic conditions, *Waste water treatment, Biological treatment, Equations, Solid

Matterial Cell yield coefficient, Retention time, Sludge age, Influent organic concentration, Microbial concentrations.

A simplified approach is taken to describe continuous flow aerobic biological waste water treatment processes through utilization of the variable ob-served cell yield coefficient. For specific waste water and constant environmental conditions, the magnitude of the variable observed yield coeffi-cient is dependent upon net cell growth rate, or its reciprocal, sludge age or mean cell residence time. Illustrations show interrelationships between the aeration basin hydraulic retention time, the sludge age, the influent organic concentration, the microbial concentrations in the waste line and aeration basin, and the mass of waste solids produced per unit time. Similar sets of relationships and equations also could be developed for other fluidized culture microbial processes such as nitrification, denitrification, and methane fermentation. (Sandoski-FIRL) W75-00963

FLUORIDE VARIATION IN DOMESTIC SEWAGE RELATIVE TO TAP WATER AND

PRECIPITATION, Saskatchewan Univ., Saskatoon. Dept. of Civil

Engineering. C. P. Hwang. Water and Sewage Works, Vol 121, No 4, p 138-139, April 30, 1974. 1 fig, 2 tab, 3 ref.

Descriptors: *Potable water, *Water reuse, *Precipitation(Atmospheric), Domestic wastes, Sewage treatment, Water pollution sources, *Canada.
Identifiers: *Saskatchewan(Canada).

Due to increasing population and lack of adequate water resources it may be necessary to utilize sewage as reclaimed water for public drinking. A knowledge of the variation of fluoride content of sewage can be important for dental purposes as well as in determining if troublesome sewage is from groundwater or sewage and estimating the amount of infiltration or direct inflow to the sewerage system. The distribution of precipitation and fluoride concentration in tap water and domestic sewage for one year is tabulated for the area of Saskatchewan, Canada. Also the relationships between monthly total precipitation and average fluoride content in tap water and domestic sewage are presented. (Sandoski-FIRL) W75-00965

PROGRAMS AND PROSPECTS FOR WATER POLLUTION CONTROL,
North Carolina Water Resources Research Inst.,

Raleigh. For primary bibliographic entry see Field 5G.

CONCEPTUAL ASPECTS OF WATER REUSE, Netherlands Waterworks, Rijswijk. Testing and Research Inst.

D. Kuiper, and R. Wechsler. Water Research, Vol 8, No 8, p 529-534, August, 1974. 3 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Water reuse, Descriptors: "Model studies, "Water reuse, *Recirculated water, "Reclaimed water, "Municipal water, Water utilization, Impaired water use, Recharge, Reclamation, Wastewater, Water supply, Water demand, Municipal wastes, Mathematical models, Design, Research and development, Pollutants, Potable water, Water pollution sources, Water pollution, Water pollu-tion control, Water pollution treatment, Water quality. quality.
Identifiers: Municipal recycle system.

Wastewater re-use is receiving increasing atten-tion because of its potential for augmenting water supplies. A simple municipal water recycle system examines the relationships among the treatment intensity, pollutants accumulation, and number of times water is re-used. Assumptions include that the re-use is a steady state system, the supplementary system does not contain pollutants, there is no water loss in the treatment process, and the influence of rain is not considered. Using these assumptions, equations are developed relating the sumptions, equations are developed relating the treatment process, the quality of reclaimed water, and the extent of re-use. The accumulation factor, the water quality depreciation resulting from once-through use, and the re-use factor, the average number of times a volume element of water is recycled, are described and related. Other cases studied include supplementation by a polluted water source, water loss from the system, and supplementation by a supply containing specific pollutants of non-domestic origin. The derived relation-ship between the three factors studied is valid for several worst case practical conditions, and the extent of re-use possibilities under practical condi-tions is four. (Grden-North Carolina) W75-00998

WATER SUPPLY AND SEWERAGE SYSTEMS PLANNING PROGRAM, Black River-St. Lawrence Regional Planning Board, Canton, N.Y. D. S. King.

Comprehensive Planning Series, Report Number 4, 1973. 50 p, 2 fig, 14 ref, 2 append.

Descriptors: *Water supply, *Water quality, *Management, Projects, *Planning, Regional development, Standards, Governments, Local governments, Water treatment, *Regional analysis, *New York, Waste water treatment, *Sewerage.

Identifiers: Sewerage systems, Urban develop-ment, Regional review, Federal agencies, State agencies, Environmental health.

Presented is an initial attempt to define: (1) goals Presented is an initial attempt to define: (1) givens and objectives specifically related to water quality management planning; (2) the differing federal agencies that not only fund municipal water/sewer projects, but that have become aware of the benefits of comprehensive planning related to such projects; (3) the roles, jurisdictions, and interestinguishing of state agencies involved with terrelationships of state agencies involved with similar water quality management interests, and

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their legislated regulatory powers; (4) county and local governments, planning experiences and directions; (5) the coordinative role that the Board can fulfill in acting not only as an informational center, but also as a mediatory between local government and state and federal governmental government and state and federal governmental agencies; and (6) a program whereby environmental health facilities' plans are attuned to the desires, goals, and financial capabilities of regional residents. (Bell-Cornell) W75-01004

APPARATUS FOR GRAVITY SEPARATION OF

IMMISCIBLE FLUIDS, Pineville Kraft Corp., La. (assignee) J. A. Whelan, J. R. Henry, and H. H. White. U.S. Patent No. 3,804,261, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 921, No 3, p 1029, April 16, 1974.

Descriptors: "Patents, "Pulp wastes, "Waste water treatment, Water quality control, "Water pollution control, Skimming, "Separation techniques.

Identifiers: *Gravity separation, Tall oil soap, Kraft production.

The invention utilizes gravity separation of two immiscible fluids but prevents short circuiting of the incoming fluids to the discharge of the the incoming fluids to the discharge of the skimming vessel and causes the incoming fluids to pass through an unagitated zone of zero upward velocity. The mixture is fed to the lower end of a large skim tank through a ring header to provide uniform distribution of the tall oil soap in the black liquor. These liquids flow upward in the outer vessel. There is also provided an inner vertical baffle tank open at the top which is otherwise not in fluid tank open at the top which is otherwise not in fluid communication with the outer tank. The soap will communication with the outer tank. The soap will continue to flow upward where it is raked off or otherwise skimmed off by known means such as a launder collecting device. The black liquor reaches a point of zero upward velocity adjacent the top of the inner tank and will begin to displace the liquor flowing out of the discharge pipe of the inner tank. The inner tank may also have a fill line so that it may be filled at the same time the outer tank is filled to relieve pressure during start up. (Sinha-OEIS) OEIS) W75-01031

WASTE TREATMENT SYSTEM, Westinghouse Electric Corp., Pittsburgh, Pa. (assignee)

Watson, Jr., C. Labovitz, and P. R. Mulik U.S. Patent No. 3, 831,758, 4 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 925, No 4, p 1241, August 27, 1974.

Descriptors: *Patents, *Pollution abatement, *Waste water treatment, *Flocculation, *Filtration, Water pollution control, Water quality control, Carbon filters, Equipment.

The system contemplates a sequence of operations including comminution, the addition of a chemical flocculating agent in a surge conditioning tank or in the input to the flotation cells and dissolved air flotation in a plurality of series coupled flotation cells with stagnation regions between. Carbon filtration or other means may be utilized at the end of this throughput scheme where desirable. The parallel flotation system found most desirable in-cludes two flotation cells within a single tank which is baffled along its length so as to divide the tank into two separate flotation cells with two minute bubble producing manifolds in each of the cells. The end of the first cell and the beginning of the second cell may serve as a stagnation region by placing a perforated baffle across the ends of both cells. A single air infusion pump and contacting vessel serves both cells with the output of the contacting vessel being divided between the bubble producing manifolds in each cell. It is contemplated that the first of the series of cells will have a bisher flow rate or recycle rate they the second or plated that the first of the series of cells was not higher flow rate or recycle rate than the second or subsequent in the series of cells. (Sinha-OEIS) W75-01035

WATER CLARIFICATION, General Mills Chemicals, Inc., Minneapolis, Minn. (assignee)

(assignee)
F. M. Werdouschegg.
U.S. Patent No. 3,830,736, 4 p, 5 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 925, No 3, p 959, August 20, 1974.

*Patents, *Flocculation, *Waste water treatment, Pollution abatement, Water quality control, Water pollution Identifiers: *Clarification, Metal salts, Galactomannan gum, Carboxyalkyl groups.

A method of clarifying water containing organic material consists of dispersing a soluble trivalent metal salt in the water thereby neutralizing the zeta potential in the system and initiating coagula-tion and dissolved, colloidal or suspended organic materials in the water and subsequently dispersing an anionic derivative of galactomannan gum in the water thereby flocculating the coagulated material. The anionic derivative of galactomannan gum is selected from carboxyalkyl ether of galactomannans, wherein the carboxyalkyl groups contain 2 to 4 carbon atoms, and carboxyalkylated hydroxto a caroon atoms, and carboxyalkylated hydroxyalkyl ether of galactomannans wherein the carboxyalkyl groups contain 2 to 4 carbon atoms and the hydroxyalkyl groups contain 2 to 8 carbon atoms. (Sinha-OEIS) W75-01037

FLUID TREATING APPARATUS, Morton-Norwich Products, Inc., Chicago, Ill. D. E. Heskett.

U.S. Patent No 3,831,754, 17 p, 13 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 925, No 4, p 1240, August 27, 1974.

*Patents, Descriptors: *Patents, *Ion exchange,
*Demineralization, *Water treatment, *Water sof-Descriptors: tening, Brine, Resins, Equipment, Color, Water quality, *Waste water treatment.

Identifiers: *Fluid treatment, Exchange rates,

The fluid treating apparatus has a treating cartridge made of an active treating material, such as an ion exchange matrial, which undergoes dimension change upon reduction of its treating capacity as well as upon regeneration of the capacity. A regenerant source (e.g. brine) for generating the ion exchange resin, and a dimension sensing mechanism which also operates flow control valves within the apparatus are included. The car-tridge is regenerated as required by flowing brine or other regenerative material through the cartridge, after which the apparatus automatically returns to its original state. The operation of all valves is completely hydraulic in one embodiment or operated electromechanically in another emnent. The apparatus is arranged so that the cartridge dimension is sensed only when fluid flow through the cartridge is interrupted so that regeneration will not occur during use. Fluid bypasses the cartridge during regeneration so that flow is not interrupted unintentionally. The active into a cartridge to provide the system with an ex-tremely high rate of exchange. (Sinha-OEIS) W75-01039

FILTRATION APPARATUS, Ecodyne Corp. Chicago, Ill. (assignee)
B. L. Goodman, F. G. Weis, and K. A. Mikkelson. U.S. Patent No 3,831,755, 6 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office. Vol 925, No 4, p 1240, August 27, 1974.

Descriptors: *Patents, *Filtration, *Waste water treatment, "Water treatment, Pollution abatement, Water quality control, Water pollution control, Filters, Equipment.

An apparatus is described for the cleaning of filter beds of a filtration apparatus which has a plurality of filter units. Each of the units has an upper influent zone, a filter bed, and a lower filtrate zone and includes means for pumping liquid from all of the filtrate zones at a given pumping rate. During the service cycle, liquid is pumped from the filtrate zones to service so that it passes through the filter bed in a downflow direction. When one of the filter units requires backwashing, the pump is employed to pump liquid simultaneously from the filtrate zones of a majority of the filter units, so that the backwash rate is greater then the normal downflow rate through the filter unit. An increased backwashing rate can be provided by using booster pumps. (Sinha-OEIS)

AERATION PLANT FOR CLARIFYING SEWAGE AND WASTE EFFLUENTS, I R Kaelin

U.S. Patent No 3,814,395, 7 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 923, No 1, p 193, June 4, 1974.

Descriptors: *Patents, *Aeration, *Sewage treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Effluent, Rotors, Equipment.

The aeration rotor is positioned at least partially submerged in the liquid in the tank. The rotor rotates about a vertical axis and has a shaft position on the vertical axis. A first wall member is secured centrally to and extends radially outward from the shaft and a second wall member extends radially outward from the shaft and has a centrally arranged opening which is concentrically disposed about the shaft of the rotor. Partitions secured to and extending between the first and second wall members form a plurality of guide channels defining flow passageways. There is also provided means for feeding air into each flow passageway at a location where the liquid is moving laterally towards the outer edges of the wall members. (Sinha-OEIS)

TREATMENT OF AQUEOUS SOLUTIONS CON-TAMINATED WITH SOLUBLE ORGANIC MATERIALS

Dow Chemical Co., Midland, Mich. (assignee) C. B. Murchison, R. E. Bailey, and R. W. Diesen. U.S. Patent No 3,819,515, 6 p, 9 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1491, June 25, 1974.

Descriptors: *Patents, *Organic wastes, *Oxidation, *Waste water treatment, *Liquid wastes, Pollution abatement, Water pollution control, Water quality control, Carbon dioxide, Iron, Atmospheric pressure, Hydrogen ion concentra-Identifiers: Light energy.

A process for oxidizing organic matter in an aque-ous liquor is claimed. Carbon dioxide is produced and the organic matter contains an electron donating atom. The pH of the aqueous liquor is maintained in the range of 2 to 4. Gaseous oxygen is mixed with the aqueous liquor in the presence of a catalytic quantity of solubilized iron cations ranging in an amount from about 1 to about 500 parts per million of the aqueous liquor. The aqueous liquor is subjected to light waves ranging in length from about 5800 deg A to about 2000 deg A at a temperature ranging from the freezing to the boiling point of the aqueous liquor at atmospheric pressure. This removes at least a major portion of the carbon dioxide thereby reducing the total or-ganic content of the aqueous liquor. (Sinha-OEIS) W75-01045

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PURIFICATION OF EFFLUENT CONTAINING ORGANIC MATTER.

Nehezipari Kulkereskedelmi Vallalat, Budapest

Nehezipari Kulkereskedelini Valialat, Budapest (Hungary). (assignee)
I. Praznovsky, and I. Gyulavari.
U.S. Patent No. 3,819,512, 6 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1490, June 25, 1974.

Descriptors: *Patents, *Organic wastes, *Waste water treatment, *Biodegradation, *Aerobic treatment, *Oxidation, Water pollution control, Water quality control, *Pollution abatement, Effluent, Domestic wastes, Industrial wastes.

Domestic and/or industrial effluent containing biodegradable organic impurities is passed consecutively through an auxiliary stabilizing tank and an aerobic stabilizing tank. In the latter tank the effluent is subjected to oxidation by oxygen produced by photosynthesis. A portion of the ef-fluent is recycled from the areobic stabilizing tank to the auxiliary stabilizing tank. A preferred region from which the effluent is to be recycled and a preferred period during which effluent is to be recycled are given. (Sinha-OEIS) W75-01046

5E. Ultimate Disposal Of Wastes

DISPOSAL OF OIL WASTES BY MICROBIAL ASSIMILATION,

Union Carbide Corp., Oak Ridge, Tenn. H. C. Francke, and F. E. Clark.
Report Y-1934, May 1974. 45 p, 13 fig, 15 tab, 8 ref, 2 append. W-7405-eng-26.

Descriptors: *Soil disposal fields, *Oil wastes, *Microbial degradation, Coolants, Tennessee, Ru-noff, Percolation, Evaporation, Fertilization, Identifiers: Hydrocarbons, Oak Ridge(Tenn).

Bacterial utilization of hydrocarbons can be induced in most common types of oils under op-timum conditions; the oxidation of oil is similar in many respects to the oxidation of organic compounds. When thoroughly dispersed under aerobic conditions, as in soil soaked with oil, the hydrocarbons may be rapidly and quantitatively oxidized. Recognizing that appropriate methods, procedures, equipment, and operations depend on the individual situation, experimental oil disposal tests have been conducted in the laboratory and on field plots of the Union Carbide Oak Ridge Y-12 Plant. Favorable responses from these experimen-tal tests indicated that oil wastes could be biologically decomposed aerobically when the top six inches of the soil was cultivated intermittently. This report covers progress being made in spreading the oil and coolant wastes, cultivation of the soil, and includes effluent and soil analyses. Fertilizer and organic carbon losses on the test plots were minimal in rainwater surface runoff, in soil percolate water, and by evaporation. Disposal rates were greater than 1.5 lb of oil per cu ft of soil per month and 4.45 lb of coolant per cu ft of soil per month. (Jones-Wisconsin) W75-00692

UNDERGROUND WASTE MANAGEMENT-A PEOPLE PROBLEM, Illinois State Geological Survey, Urbana

For primary bibliographic entry see Field 5G. W75-00709

CONFINED DISPOSAL FACILITY AT POINTE MOUILLEE FOR THE DETROIT AND ROUGE RIVERS (DRAFT ENVIRONMENTAL STATE-

United States Lake Survey, Detroit, Mich For primary bibliographic entry see Field 5G. W75-00732 DIKED DISPOSAL AREA, BUFFALO RIVER, BUFFALO HARBOR, BLACK ROCK CHANNEL, TONAWANDA HARBOR, ERIE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 5G. W75-00931

WATER REGULATIONS--TRANSPORTATION FOR DUMPING AND DUMPING OF MATERIAL INTO OCEAN WATERS. For primary bibliographic entry see Field 5G.

5F. Water Treatment and **Quality Alteration**

DEVELOPMENT OF A FLOOD AND POLLUTION CONTROL PLAN FOR THE CHICAGOLAND AREA, COMPUTER SIMULATION PRO-

Chicago Dept. of Public Works, Ill. Bureau of Engineering.
For primary bibliographic entry see Field 5B.
W75-00561

REVERSE OSMOSIS BIBLIOGRAPHY: AB-STRACTED AND INDEXED,
Plastics Technical Evaluation Center, Dover, N.J.
For primary bibliographic entry see Field 5D.

IS THE WATER SAFE TO DRINK. PART 2: HOW TO MAKE IT SAFER, For primary bibliographic entry see Field 5G. W75-00718

FEED NOZZLE FOR SCREENING DEVICE, Midwestern Industries, Inc., Massillon, Ohio. L. J. Riesbeck, and W. A. Blackwell. Canadian Patent 947,793, Issued May 21, 1974, Patent Office Record, Vol 102, No 21, p 21-73, May 21, 1974.

Descriptors: *Screens, *Patents, Flow control, *Separation techniques, *Nozzles, *Water treat-Identifiers: Feed nozzle.

A device for controlling the flow of a fluid material at a screen of a conventional material separator at a screen of a conventional material separator which isolates any solids consists of an adjustable baffle plate within a conical hood member. The input fluid is directed against the baffle plate and deflected against the hood member which is suspended over the screen. The fluid then follows along the hood member and falls to the screen as an annular sheet of fluid material. The precise configuration of the sheet of fluid material is configuration of the sheet of fluid material is con riguration of the sheet of fluid material is con-trolled by adjusting the axial location of the baffle plate, moving it toward and away from the direction of the flow of the input material. The solids which are unable to pass through the screen are transmitted to a discharge chute located at the periphery of the screen. (Sandoski-FIRL) W75-00722

ASBESTIFORM AMPHIBOLE MINERALS: DETECTION AND MEASUREMENT OF HIGH CONCENTRATIONS IN MUNICIPAL WATER SUPPLIES, National Water Quality Lab., Duluth, Minn. For primary bibliographic entry see Field 5A. W75-00999

WATER SUPPLY AND SEWERAGE SYSTEMS PLANNING PROGRAM, Black River-St. Lawrence Regional Planning Board, Canton, N.Y. For primary bibliographic entry see Field 5D. W75-01004

EXPERIENCES IN THE CONSTRUCTION AND OPERATION OF DAMS IN SALINE ENVIRON-

WENTS, Western Mining Corp. Ltd., Perth (Australia). For primary bibliographic entry see Field 8A. W75-01015

FLUID TREATING APPARATUS, Morton-Norwich Products, Inc., Chicago, Ill. For primary bibliographic entry see Field 5D. W75-01039

FILTRATION APPARATUS, Ecodyne Corp. Chicago, Ill. (assignee) For primary bibliographic entry see Field 5D. W75-01040

5G. Water Quality Control

AQUATIC WEED MANAGEMENT IN THE FINGER LAKES, Cornell Univ., Ithaca, N.Y.
J. Peverly, G. Miller, W. H. Brown, and R. L.

Iohnson Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 938, \$4.25 in paper copy, \$2.25 in microfiche. Technical Report No 90, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., September 1974. 50 p, 10 fig, 6 tab, 10 ref. OWRT A-050-NY(1). 14-31-0001-4032.

Descriptors: *Aquatic weed control, *Dredging, Sediments, 2-4-D, Diquat, Physical properties, *Herbicides, *New York, Lakes, Water pollution

Identifiers: Plastic film, Eeel grass, *Water mil-foil, Najas sp, Underwater cutting, *Cayuga Lake(NY), Glyphosate.

About 80 percent of the north 12 square miles of Cayuga Lake is infested with aquatic weeds. Water milfoil (Myriophyllum sp.) accounts for 54 percent of all plants, eel grass (Vallisneria americana) makes up 32 percent, and Najas sp. about 8 percent. The remaining 6 percent includes several more species. The chemical herbicides Diquat, 2,4-D granules, and Roundup (glyphosate) were tested for control of milfoil either in the lake or in greenhouse experiments. Plants treated with Diquat at recommended rates in the lake showed no control and those treated with 2,4-D granules exhibited almost complete control. In a greenexhibited almost complete control. In a green-house experiment using Roundup (hlyphosate), milfoil was not controlled except at prohibitively high concentrations. Underwater cutting both in the lake and in the Cornell Pond Facility produced temporary control, but regrowth was rapid. Beds control was achieved with two cuttings, one in control, but regrowth was rapid. Best control was achieved with two cuttings, one in late June and another in late July. One late season harvest to remove overwintering plant material may be a very effective control measure. Plastic film, floated or held on the bottom, gave very good con-trol for small areas. Floating shades promoted the growth of less troublsome species, as did the physical removal of root material. Long-term solu-tions to the weed problem will probably require removal of the fertile bottom sediments in which milfoil now grows. W75-00554

CONTINUED EFFECTS OF TROPICAL STORM AGNES (1972) ON AQUATIC WEED GROWTH, Cornell Univ., Ithaca, N.Y. J. H. Peverly, R. T. Oglesby, A. Vogel, and R.

Johnson. Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PB-236 926,

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\$3.25 in paper copy, \$2.25 in microfiche. Technical Report No 91, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., September 1974. 16 p, 1 fig, 2 tab, 1 ref. OWRT A-046-NY(1). 14-31-0001-4032.

Descriptors: *Aquatic vascular plants. *Standing Descriptors: "Aquatic vascular plants, "Standing crops, Physical properties, Succession, Sedi-ments, Light, "New York, Plant populations, Hur-ricanes, Growth rates, Water pollution control. Identifiers: "Cayaga Lake(NY), "Water milfoil, *Tropical Storm Agnes(1972).

Tropical Storm Agnes produced increased suspended sediments and decreased water trans-parency at the southern end of Cayuga Lake for a sustained period during the early summer of 1972. The 1972 community of submerged vascular plants was severely affected. Standing crops were drastically reduced and the species composition of the plant community changed compared to 1970. In 1973, standing crop values had increased to 87 percent of those of 1970. However, shifts in spatial distribution had occurred and the community had further changed to one highly dominated by Myriophyllum sp. with the virtual exclusion of some previously abundant forms, especially Heteranthera dubia. Shifts in species composition of an aquatic plant community may not always be the result of long-term changes in the environ-ment, but rather be a result of single intense storm events. It is suggested that rooted aquatic plant growth could be suppressed by manipulating artificially the amount of light reaching the plants at certain critical periods of growth.

W75-00555

A FEASIBILITY STUDY FOR A MOBILE SUB-MERSIBLE VEHICLE TO BE USED FOR THE CONTROL MANAGEMENT, STUDY OF NATU-RAL PROCESSES, PROTECTION AND CON-SERVATION OF INLAND WATER, Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 7B.

THE RELATIONSHIP OF WATER QUALITY TO LAND USE AROUND LAKES.
East Central Florida Regional Planning Council, Winter Park.

W75-00556

Final Report ECFRPC 73-7, June, 1973. 81 p, 3 tab, 3 fig, 6 ref, append. CPA-FL-04-30-1004.

Descriptors: *Water quality, *Water quality con-Descriptors: "Water quality, "Water quality con-rrol, "Land management, Land resources, Natural resources, "Florida, Surface waters, Bodies of water, Lake sediments, Runoff, Water pollution treatment, Sewage treatment, Water treatment, Water purification, Waste dilution, Water resources, Water pollution, Water pollution ef-fects, Abatement, Water pollution sources, Water policy, Water management

policy, Water management. Identifiers: *Orlando(Florida), Orange Co(Fla), Seminole Co(Fla), Osceola Co(Fla), Storm water

Land uses were inventoried for 111 major lake basins in the Orlando Metropolitan Region, includ-ing Orange, Seminole, and Osceola Counties. Many lakes in Central Florida have been due to waste water discharges, construction near the lake, and runoff of excess water from land surfaces. Nineteen lakes were selected for examining water quality as it relates to the principal land uses surrounding the lake. Multiple regression analysis was used to describe the relationship between water quality and land use. In the Orlando area, water quality data were insufficient to draw water quanty data were insufficient to draw concrete conclusions about effects of land use on lake water quality. The following data are needed: people activities (traffic volume, construction, new development, and recreation events), environmental (condition of structures, condition of parcels, condition of drainage channel and main-tenance of streets), physiographic (average stream

slope, average land slope, imperviousness, and ground cover), stream flow, and pollution parameter concentration. Pollution abatement techniques suggested include reuse after treatment, diversion to sewage treatment facilities, improved street cleaning, percolation and injection, screening for debris, and increased public education about the desirability of legislation. More research into pollution abatement techniques is needed. (Grden-North Carolina) W75-00560

LAND USE CONTROLS IN WATERSHED AND AQUIFER RECHARGE AREAS, For primary bibliographic entry see Field 4B. W75-00597

STUDIES ON THE VARIATION OF RIVER WATER WITH TREATMENT OF NATURAL POISONOUS ACID WATER, (IN JAPANESE), For primary bibliographic entry see Field 5D. W75-00598

A NATIONAL WATER STRATEGY FOR EN-GLAND AND WALES, For primary bibliographic entry see Field 6E. W75-00600

APPARATUS FOR DISINTEGRATING AND SEPARATING MATERIAL IN FLUID SUSPEN-SION

Improved Machinery, Inc., Nashua, N.H. Canadian Patent 947,705. Issued May 21, 1974. Patent Office Record, Vol 102, No 21, p 21-54, May 1974.

Descriptors: *Patents, *Pumps, *Separation *Suspensions, techniques, *Suspensions, Equ. Discharge(Water), Water pollution control. Identifiers: Vortices, Baffles. Equipment,

An apparatus was patented comprising a chamber containing a centrifugal pump arranged to pump material in fluid suspension. The material is pumped to an accepts discharge, and a screen which limits the size of the material supplied by the pump to the accepts discharge is mounted with the pump to be rotatably driven. This causes disin-tegration of coarse material in the suspension. Baffle means adjacent to the screen feed face divide the chamber into communicating inner and outer portions. Suspension is supplied to the screen portions. Suspension is supplied to the screen through the chamber inner portion; and rotary vanes induce vortex flow of suspension in the chamber outer portion. Thus heavy material is separated from the suspension by centrifugal separation. The heavy rejected material is discharged from the chamber through a discharge outlet. Lighter particles of coarse material rejected by the screen may be discharged from the chamber through a discharge conduit which is arranged to receive such particles from the chambers inner portion. (Prague-FIRL) W75-00609

OIL RECOVERY PROCESS,

Mobile Research and Development Corp., New York. C. A. Y. Shephard. Canadian Patent 947,644. Issued May 21, 1974.

Patent Office Record, Vol 102, No 21, p 21-41, May 1974.

Descriptors: *Patents, *Oil wastes, Gas, Reservoirs, Pollution abatement, Separation techniques, Industrial wastes, Water pollution control. Identifiers: *Oil recovery, Miscibility.

Disclosed is a process of recovering oil from an oil-containing reservoir having a gas cap. A fluid is injected into the gas cap that is miscible with the oil in the reservoir and gas in the gas cap. Also in-jected into the reservoir are gas and water in an

amount no greater than that amount which can be maintained within the gas cap without flowing into the oil zone. Oil is produced from the reservoir from locating that are structurally lower than the gas cap. (Prague-FIRL) W75-00610

SELENIUM IN THE WATER RESOURCES OF NEBRASKA IN COMPARISON TO PUBLIC HEALTH STANDARDS, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 5B.

PROCEEDINGS OF NAVAL ENVIRONMENTAL PROTECTION DATA BASE, INSTRUMENTA-TION WORKSHOP. For primary bibliographic entry see Field 5A. W75-00644

NAVY ENVIRONMENTAL QUALITY GUIDES FOR OFFSHORE AREAS,

Naval Oceanographic Office, Washington, D.C. J. B. Rucker.

In: Proceedings of Naval Environmental Protection Data Base Instrumentation Workshop, July 11-12, 1972, Channel Islands Harbor: Naval Civil Engineering Laboratory Publication, p 21-25, 1972. 1 fig.

Descriptors: *Water pollution control, *Military aspects, *Waste disposal, Mapping, Monitoring, Pollutant identification, Environment, *Data col-

Some of the major environmental parameters ad-dressed in the Naval Oceanographic Office Environmental Quality Atlas series are discussed. The environmental information for each parameter will be presented for each season. The Environmental Quality Atlas is designed to provide environmental data to permit the development of operational practices that will lessen the environmental impact of naval activities. (See also W75-00644) (Knapp-USGS) W75-00648

OIL-IN-WATER MONITORING AND MEASUR-

ING, Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5A.

ENVIRONMENTAL QUALITY MONITORING Engineering

RESEARCH, Army Medical Environmental Engine Research Unit, Edgewood Arsenal, Md. For primary bibliographic entry see Field 5A. W75-00664

DRIFT OF TERRESTRIAL ARTHROPODS IN AN IRRIGATION CANAL FOLLOWING A WIDE-AREA APPLICATION OF ULV WIDE-AREA MALATHION.

Nebraska Univ., Lincoln. Dept. of Entomology. D. Urbauer, and K. P. Pruess. J Econ Entomol, Vol 66, No 6, p 1267-1268, 1973.

Invertebrates, *Insect control, Descriptors: *Insecticides, Canals, Irrigation canals, Diptera, *Aquatic drift.

Identifiers: Ants, Arthropods, Cicadellidae, Hymenoptera, *Malathion, Miridae, Odonata, Orthoptera, Paracantha-culta, Tetragnathidae, Thomisidae, Spiders, *Insect drift, Drifting.

Numbers of arthropods drifting in an irrigation canal were recorded at 30-min intervals during and after an upstream application of ULV (ultra low velocity) malathion. Flower-visiting and parasitic

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Hymenoptera were the 1st insects to increase; a bimodal drift pattern resulted from an interuption in the spray application. Diptera exhibited a delayed response but the numbers collected, especially Paracantha culta (Wiedemann), suggest high susceptibility. Ants occurred in large numbers over a long period, but mortality was probably low. Miridae and Cicadellidae were probably more tow. Miridae and Cicadellidae were probably more susceptible than Orthoptera and adult Odonata, but had similar delayed drift patterns. Tetragnathidae were the most, and Thomiscidae the least, susceptible spiders.—Copyright 1974, Biological Abstracts, Inc. W75-00675

AN INVESTIGATION OF THE RETURN FLOW FROM IRRIGATED LAND,
Texas A and M Univ., College Station. Water

Resources Inst. For primary bibliographic entry see Field 5B. W75-00698

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CON-STRAINTS - PHASE I, Nevada Univ., Reno. Center for Water Resources

Research.

R. L. Bateman, A. B. Cunningham, and J. A.

Westphal.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 069, \$3.25 in paper copy, \$2.25 in microfiche. Project Report No 24, January 1974. 15 p, 7 fig, 8 ref. OWRT C-4190(9031)(1). 14-31-0001-9031.

Descriptors: *Computer models, *Water resources development, *Water quality, *Water supply, Drainage effects, Irrigation systems, Flood irrigation, *Nevada, Southwest US, Statisti-cal models, Synthesis, Time series analysis,

Dendrochronology.

Identifiers: *Carson River(Nev), *Truckee

Aim is development of an inorganic water qualityflow management model in which both water supply and quality criteria are considered for for-mulation of operating rules. Truckee-Carson system of northwest Nevada is being used as a prototype. Evaluation of flow and quality data show that the Carson system is generally amenable to application of the type of inorganic quality-simulation model previously developed on the Tahoe-Truckee portion of the Truckee-Carson system. Preliminary predictive relations of the type utilized in the quality simulation model are developed for several sites within Carson system. Problems encountered in development of sound predictive relations in river reaches where intensive irrigated agriculture is practiced are discussed. Results of an attempt to improve stochastic generation of flows by incorporating responses which may be attributable to long-term systematic climatic behavior are reported. Tentative correlation is made between historic annual streamflow and tree growth. Results of this and previous work indicate that final correlations (gamma values) can be expected to be on the order of 0.7 to 0.8. W75-00701

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGEMENT, VOLUME I: DEVELOPMENT OF THE GROUND WATER QUALITY MODEL, California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 2F. W75-00702

MATHEMATICAL MODELING OF WATER QUALITY FOR WATER RESOURCES MANAGMENT, VOLUME II: DEVELOPMENT OF HISTORIC DATA FOR THE VERIFICATION

OF THE GROUND WATER QUALITY MODEL OF THE SANTA CLARA-CALLEGUAS AREA, VENTURA COUNTY,

California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 2F. W75-00703

UNDERGROUND WASTE MANAGEMENT -- A PEOPLE PROBLEM, Illinois State Geological Survey, Urbana.

F. C. Frye.

The American Association of Petroleum Geologists Bulletin, Vol 58, No 4, p 749-752, April, 1974. 1 ref.

Descriptors: *Underground waste disposal, *Land management, *Geology, Wastes, Liquid wastes, Industrial wastes, Radioactive wastes, Sewage effluents, Farm wastes, Waste storage, Suspended

The application of earth science to underground waste management is discussed. There are four categories of wastes: man made refuse, industrial liquid wastes, high-level radioactive wastes, and sewage effluents and some agricultural wastes. Sewage effluents are becoming increasingly important in the total waste management problem. Subsurface disposal is one problem in the management of wastes. There is clearly a trend toward spreading sludge on the surface, and at least one major metropolitan area has started a system of rock tunnels for transporting and storing combined sewage and storm water. It is estimated that 8.8 billion pounds of suspended solids from the sewer serviced population of the United States is transported annually. Other problems include the land-fill problem, the purpose of a monitoring system, whether only naturally safe disposal sites can be used, the recycling of relatively inert and non-hazardous solid wastes, and the disposal well problem. (Merritt-FIRL) W75-00709

ESTABLISHING A QUALITY CONTROL PROGRAM FOR A STATE ENVIRONMENTAL LABORATORY,

R. P. Frazier, J. A. Miller, J. F. Murray, M. P.

Mauzy, and D. J. Schaeffer. Water and Sewage Works, Vol 121, No 5, p 54-57, 75, May, 1974.

Descriptors: *Laboratory tests. *Testing procedures, *Quality control, Performance, Evaluation, Scientific personnel, *Water pollution

In order to assure the quality of analytical labora-tory work, the Illinois Environmental Protection Agency continues to improve its quality control program. This program was experimental, developing in response to efforts to solve specific problems. A quality control program can serve many functions by measuring the precision and/or many functions by measuring the precision and/or accuracy of a procedure, providing information on the relative performance of labs, improving the validity of analytical data used for legal purposes, and detecting faulty methods. The most important effect of the programs described is an increased consciousness by the individual analysts, regardless of skill level, that they are professionals, doing a difficult non-routine job using routine techniques. (Sandoski-FIRL) W75-00715

A NEW LOOK FOR WATER MANAGEMENT IN SCOTLAND,

J. I. Waddington, and D. Hammerton. Effluent and Water Treatment Journal, Vol 14, No 4, p 211-217, April, 1974. 3 fig, 1 tab.

Descriptors: *Water supply, *Water management, Administration, Local governments, Sewerage, Sewage treatment, Flood control.
Identifiers: *United Kingdom(Scotland). Beginning in May 1975, water supply and sewerage in Scotland will be managed by the new regional authorities with only river purification boards remaining outside local government. The historical reasons for Scotland splitting from Great Britain are examined. The new system is described in the context of local government reform, and, the future prospects for water management are discussed. (Sandoski-FIRL) W75-00716

IS THE WATER SAFE TO DRINK. PART 2: HOW TO MAKE IT SAFER, R. H. Harris, and E. M. Brecher.

Consumer Reports, Vol 39, No 7, p 538-542, July,

Descriptors: *Potable water, *Water quality standards, *Water supply, Water quality control, Folution abatement, Activated carbon, Chlorination, Ozone, Research and development, *Water treat-

In recent decades many lakes and rivers from which millions obtain drinking water have become increasingly polluted. Uncontrolled dumping of industrial wastes and municipal sewage combined with the runoff of agricultural chemicals has created serious contamination in the raw water sources. Safeguarding the quality of today's drink-ing water requires more than protection against bacterial hazards. Many systems, however, still ignore the potential dangers of viruses, heavy metals, and organic chemicals. Described are steps the water supply companies can take to achieve improved standards of drinking water quality. (See also W74-10897) (Sandoski-FIRL) W75-00718

SOUND STANDARDS FOR ENVIRONMENTAL IMPROVEMENT, Environmental Protection Agency, Washington,

R. E. Train

American Gas Association Journal, Vol 56, No 4, p 26-27, 29, April, 1974.

Descriptors: *Standards, Environmental effects, *Regulation, Testing procedures, Sampling, Statistical methods, Air pollution, Water pollution.

Environmental standards and their development at the Environmental Protection Agency are discussed. The standard setting process begins with the gathering of all available data on the health and environmental effects of a particular pollutant. The proposed standard is first circulated within the EPA and then in other federal agencies and organizations for comments and criticisms. After changes are made in the proposed standard, it is recirculated. After final approval, the new regulation is published in the Federal Register. An environmental standard is a norm of tolerance ex-pressed as a numerical value indicating a concentration of a pollutant for a given duration of time. Standards should also specify the test method to be used and should include adjustments which be used and should include adjustments which would bring other recognized and feasible test methods into equivalency with the specified test method. The sampling method must also be an integral part of the standard. A standard statistical technique for determining the validity of the sample results is also recommended to be incorporated in the standard. (Merritt-FIRL) W75-00725

COMPILATION-STATUTES LEGAL COMPILATION-STATUTES AND LEGISLATIVE HISTORY, EXECUTIVE OR-DERS, REGULATIONS, GUIDELINES AND RE-PORTS (PESTICIDES) VOL. I, II, III. Environmental Protection Agency, Washington,

D.C. Office of Legislation.

For sale by Superintendent of Documents, US Govt Printing Office, as Stock number 5500-0069, \$7.25/3 vol set. Legal Compilation--Statutes and

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Legislative History, Executive Orders, Regulations, Guidelines and Reports (Pesticides) Vol I, II. III. Jan. 1973. 1566 p.

Descriptors: *Legislation, *Federal government, *Administrative decisions, *Legal aspects, *Regulation, Pesticides, Control, Coordination, Adoption of practices, Decision making, Economics, Institutional constraints, Administrative agencies, Management, Political aspects, Standards, Water law, Governments, Insecticides, Fungicides, Rodenticides, Administration, State governments, Water quality, Water quality standards.

Identifiers: *Administrative regulations, *National Environmental Policy Act.

Eight chapters of legal compilations were promulgated by the Environmental Protection Agency (EPA). Each chapter has as a goal a convenient assembling of the legal authority under which the EPA operates in that particular area of environmental law. The authorities listed are statutes, their legislative histories, executive orders, regulations, guidelines and reports. This chapter includes in three volumes the legal authority controlling pesticides and their use, and is catalogued by the form of authority. For instance, the first section concerns statutes and legislative histories and is further broken down into subsections on each relevant statute, bill or amendment. The compilations represent a legal encyclopedia to congressional, executive, or administrative pronouncements on subjects relevant to the EPA and its field of responsibility. The chapter includes guidelines for pesticide levels in natural waters, and chemical control of eutrophication. (Salley-Florida)

THE NATIONAL ENVIRONMENTAL POLICY ACT AS A FULL DISCLOSURE LAW, Cornell Univ., Ithaca, N.Y. Cornell Energy Project. For primary bibliographic entry see Field 6E. W75-00730

ENVIRONMENTAL EVALUATION, BOISE DISTRICT, BUREAU OF LAND MANAGEMENT, Environmental Protection Agency, Seattle, Wash. Region X. E. Moore.

Available from National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va. 22161, as PB-227 154, \$4.75 in paper copy, \$2.25 in microfiche. Oct 1973, 81 p, 6 append, 5 tab, 11 fig.

Descriptors: *Idaho, *Administrative agencies, *Water quality, *Water sources, *Potable water, Water pollution sources, Water pollution, Water control, Coordination, Adoption of practices, Planning, Decision making, Education, Manpower, Personnel management, Water conservation, Standards, Federal government, Environmental sanitation, Public health, Inter-agency cooperation, Water pollution control, Water quality standards, Environmental effects, State governments.

ments.
Identifiers: *Administrative regulations, *National
Environmental Policy Act.

Observations made during a field evaluation of the Boise, Idaho district of the Bureau of Land Management (BLM) are summarized. The purpose was to assess the effectiveness of environmental control programs in the field. The findings dealing with water law were aimed at the control of the quality of water available at three recreational sites. After inspection of the sites and sampling of the water, it was determined that the procedure safeguarding water quality must be improved. To achieve this improvement it was proposed that water quality control responsibility be shifted from the district BLM personnel to a district water supply specialist who would be in charge of sampling, following up on unsatisfactory samples, and

making an annual survey of district water quality conditions. Also water supply areas that were physically deficient should be reviewed for compliance with Public Health Service Drinking Water Standards. Finally, periodic training sessions are proposed for other employees involved with water supplies. It must be emphasized that the survey was undertaken more as an effort to gain insight into problems at the field level than to conduct in depth analysis of water quality condition. (Salley-Florida)

CONFINED DISPOSAL FACILITY AT POINTE MOUILLEE FOR THE DETROIT AND ROUGE RIVERS (DRAFT ENVIRONMENTAL STATEMENT).

MENT), United States Lake Survey, Detroit, Mich. Available from NTIS, United States Dept. of Commerce, Springfield, Va. 22161, as EIS-MI-74-0093-D(1973), \$7.50 in paper copy. December 1973. 104 p, 10 maps, 7 tab.

Descriptors: *Dikes, *Flood control, *Pollution control, *Dredging, Water pollution, Marshes, Erosion, Shoreline, Lake Erie, Great Lakes, Water law, Lakes, Water pollution control, Administrative agencies, Federal government, Michigan, Water pollution sources. Identifiers: *Environmental Impact Statement, *Pointe Mouillee, Mich.

The recommended plan consists of the construction of a diked disposal facility for polluted dredge material from the lower Detroit and Rouge Rivers at Pointe Mouillee, Michigan. The facility would be used to replace the previous procedure of open lake disposal of dredged material. Protection against wave erosion to the marsh is sought. The favorable aspects of the environmental impact of the project will be the containment of the dredge spoil reducing particulate pollution of the bay's open waters and the protection of the shoreline marshes. The replacement of the acreage of Lake Erie bottomland by the proposed structure may introduce an adverse esthetic impact on the natural landforms of the area. Historical and biological relationships of the marsh to the lake may be adversely affected. Alternatives to the proposal are set forth, and the comments of other governmental agencies are sought. Maps of the general area and the various phases of the dike construction proposal are included. (Sperling-Florida) W75-00732

REVIEW REPORT ON THE COLUMBIA-NORTH PACIFIC REGION CONPREHENSIVE FRAMEWORK PLAN (FINAL ENVIRONMEN-TAL IMPACT STATEMENT).

Pacific Northwest River Basins Commission, Vancouver, Wash. For primary bibliographic entry see Field 6B. W75-00733

IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF PEARL HARBOR AND ITS TRIBUTARIES IN THE STATE OF HAWAII.

Environmental Protection Agency, Washington,

D.C. Available from National Technical Information Service, Springfield, Va. 22161, as PB-229 625, \$7.50 in paper copy, \$2.25 in microfiche. June 5-6, 1972. 226 p.

Descriptors: "Hawaii, "Navigable waters, "Administrative decisions, "Coordination, Adoption of practices, Water pollution, Water quality, Water quality control, Sewage effluents, Heated water, Electric power plants, Industrial wastes, Municipal wastes, Slups, Coasts, Standards, Administrative agencies, Comprehensive planning, Leadership, Management, Water quality standards, Thermal pollution, Water resources development, Resources allocation, Water management(Applied).

Identifiers: *Pearl Harbor(HI), *Coastal waters, *Administrative regulations.

The technical session of the Conference on the pollution of the navigable waters of Pearl Harbor and its tributaries was a series of interim reports from a number of agencies and private businesses on the progress toward reaching deadlines on con-trol of specific forms of pollution. Reports are included on progress in managing waste disposal from naval ships in the area waters, on the discharge of heated water from two naval generat-ing stations, on action by the city of Honolulu and the state of Hawaii to limit dumping waste into the waters, erosion controls, management of wastes from sugar companies entering the harbor through tributaries, safety of oil transmission lines, and thermal discharge by the Hawaiian Electric Company. These reports represent an attempt to determine where progress was being made and where there were delays to allow an accurate assessment of problem areas and focus attention upon them. The conference, chaired by a representative of the Environmental Protection Agency, acknowledged the interdependence of many of the projects. Such an interdependence required close attention to compliance with individual deadlines, since a delay in one project may delay others and ultimately bog down the program as a whole. Hence, the interim reporting method was not a onetime approach but would be a reoccuring check to insure continuing progress. (Salley-Florida) W75-00734

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR ARMY MILITARY PROGRAMS, Army Construction Engineering Research Lab., Champaign, Ill. For primary bibliographic entry see Field 6G. W75-00735

FEDERAL WATER POLLUTION CONTROL LEGISLATION: CURRENT PROPOSALS TO ACHIEVE MORE EFFECTIVE ENFORCE-MENT.

MENT, H. R. Hopper. Boston College Industrial and Commercial Law Review, Vol 13, p 749-781, 1972. 33 p, 225 ref.

Descriptors: "Abatement, "Legislation, "Federal government, "Water pollution control, "Adoption of practices, Legal aspects, Decision making, Water management(Applied), Water Quality Act, governments, Planning, Alternate planning, Water law, Political aspects.

One of the most difficult tasks in drafting water pollution legislation is the selection of the most appropriate method of control from a myriad of scientific, technological, and legal proposals. This comment examines the problems of achieving effective water pollution enforcement by comparing existing law with the legislative alternatives currently pending in Congress. In the context of this legislative activity the comment considers the crucial question of water pollution standards and their enforcement, disclosing the strengths and weaknesses of the various pending proposals ad offering a final assessment of the merits of each alternative. Specific areas covered include prior legislation and its inadequacies; new alternatives by effluent limitations and federal enforcement; the Senate approach (S.2770) in its proposed amendment to the Water Quality Act; and the Administration's approach. The author also discusses enforcement procedures, including administrative action, the permit system, and other issues such as penalties and citizen participation. The author concludes that the Senate approach offers the most operative alternative to existing law.

LEGAL ASPECTS OF THE ENVIRONMENT, Best, Best and Krieger, Riverside, Calif. For primary bibliographic entry see Field 6G. W75-00737

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THE CHALLENGE OF THE ENVIRONMENT: A PRIMER ON EPA'S STATUTORY AUTHORITY. Environmental Protection Agency, Washington, D.C

For primary bibliographic entry see Field 6E. W75-00738

DEVELOPMENTS IN WATER UTILITY LAW. American Bar Association, Washington, D.C., Subcommittee on Water Resources.

Journal of the American Water Works Association, p 554-566, September 1972. 13 p, 4 photo, 1

Descriptors: "Public utilities, "Water rates, "Cities, "Costs, Water quality, Pollutants, Legislation, Permits, Environment, Planning, Projects, Control, Industries, Navigable waters, Streams, Lakes, United States, Rates, Utilities, Instrumentation, Jurisdiction, Income, Economics, Regulation, Standards, Local governments, Water policy, Water resources development, Water conser-

Identifiers: *National Environmental Policy Act. *Environmental impact statement.

A major problem in the water field involves the financing of various efforts in the areas of water quality and additional water supplies. Recent legislative and judicial actions have made the problem more acute. These actions include: the assing of the Federal Water Pollution Control Amendments of 1971 which cracks down on indus-trial and municipal water polluters; the ruling by a federal district court that no discharge permit could be issued under the Refuse Act of 1899 until the Corps of Engineers filed an environmental impact statement; and the breaking of new legal ground by the justice Department in invoking federal common law in a pollution case. Local decisions which reflect the financing problems faced by the water industry are discussed. What is a reasonable rate base. What is a fair rate of return. What expenses and revenues should be considered in rate making. How much voice should citizens have in rate matters. The current wave of concern over the environment and quality of life now poses new and expensive problems to the water industry. (Chennault-Florida) W75-00739

LEGAL ACTION TO CURB POLLUTION OF K. Hennessee

In: Sea Grant Publication UNG-SG-73-01, p 119-128, March 1973. 10 p, 53 ref.

Descriptors: *Water pollution sources, *Water pollution control, *Jurisdiction, *Water pollution, *International law, Water law, Oil pollution, Shipping, Water quality, Indicators, Legislation, Water pollution effects, Federal Water Pollution Control Act, Pollution abatement, United Nations, Water resources development, Planning, Water conservation, Oceans, Federal government.
Identifiers: *International agreements, *Coastal

Pollution of the sea is a grave problem for both environmentalists and a number of industries. The major factors contributing to sea pollution are oil emissions, offshore oil drilling operations, shipping, fuel discharge from airplanes, and river and bay pollution. The most frequently used ap-proach in the United State: to curb this pollution is the use of statutory penalties for pollution. Other countries have adopted similar legislation. A second legal method for curbing pollution is the use of the civil law suit against the responsible person or company. Damages or injunctive relief may be sought. A third avenue of approach to pollution control is through technical regulatory schemes. Fourth, polluters themselves contribute to control by voluntary action. Fifth and most significant, are international agreements to curb oil pollution. A major barrier to effective control of pollution of

the sea is presented by the problem of jurisdiction. Five traditional bases of jurisdiction are discussed to point up difficulties and suggest solutions. De-tection of pollution and enforcement present problems. Applicable principles of international law are mentioned. (Sperling-Florida)

ORTHOPHOSPHATE IN GROUND WATER, HALL COUNTY, NEBRASKA, Nebraska State Dept. of Environmental Control, Lincoln. Water Pollution Control Div. For primary bibliographic entry see Field 5B.

RECLAMATION OF WATER RIGHTS, Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E.

OFFSHORE OIL DRILLING: A COMPARISON OF STATE LAWS,

J. M. Geil. In: Sea Grant Publication, UNC-SG-73-01, p 138-146, March 1973. 7 p. 71 ref.

Descriptors: *Oil industry, *Legislation, *Oil reservoirs, *Offshore platforms, Resources development, Oil fields, Drilling, International waters, Oil wells, Structures, Oceans, Continental shelf, United States, Natural resources, Resources allocation, Water law, Water policy, ederal government.

Identifiers: *Territorial waters, *Coastal zone management.

The ways in which several states with appreciable interests in petroleum exploration have dealt with offshore oil drilling legislation are compared. Jurisdiction, ownership of petroleum, requirements of exploration, requirements for production, and financial arrangements between the state or landowner and the oil companies, constitute the basic problems. Four different systems of ownership of inderwater petroleum are set forth. A central p ciple of United States mineral legislation is that the landowner of the surface has a right to the proceeds from mining operations. United States legislation also deals with operations relating to the continental shelf. The law of Great Britain grants the state the right to regulate exploration and production. British law differs from Dutch law in that no state participation is required. Exploration and production of oil in the continental shelf off Denmark has been awarded to a consortium made up of a Danish shipping magnate and private oil companies. The Middle East, possessing a great number of valuable oil fields, produces oil under 'equal profit split' contracts. In Argentina, the state and private and mixed companies explore and produce oil for the state. The Mexican government owns all oil within the national territory. (Sperling-Florida) W75-00803

TOXIC POLLUTANTS HEARINGS REGS AMENDED. Pollution Control Guide, Vol 3, paragraph 19830, p 19517-19518, 1974.

Descriptors: *Administrative agencies, *Adoption of practices, *Administration, *Federal government, Decision making, Federal Water Pollution Control Act, Effluent standards, Environmental sanitation, Toxicity, Pollutants, Consumptive use, Fishing, Recreation, Industrial waste, Waste water discharge, Water law, Water pollution, Legislation, Regulation, Water quality control, Water quality. Identifiers: *Administrative regulations.

The Environmental Protection Agency has adopted amendments to regulations in connection with the establishment of effluent standards for

toxic pollutants. The Agency is of the belief that views, arguments, and data submitted by the public should be considered in the formulation of effluent standards for toxic pollutants. The standards affect not only the industries which discharge the pollutants, but also fishermen, sport-smen, and anyone who drinks water which might contain one of the pollutants which are subject to the standards. However, the parties at the first hearing included thirty-four industries, two environmental groups, but no members of the pub This underscores the need to provide for wider public participation. These amendments clarify that all public comments will be admitted to the record of the hearing. (Sperling-Florida) W75-00928

DIKED DISPOSAL AREA, BUFFALO RIVER, BUFFALO HARBOR, BLACK ROCK CHAN-NEL, TONAWANDA HARBOR, ERIE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Buffalo, N.Y.

Available from National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va 22161 as EIS-NY-73-1473-F, \$7.00 in paper copy, \$2.25 in microfiche. September 7, 1973. 96 p, 9 tab, 1 photo, 6 map, 5 fig.

Descriptors: *Environmental effects, *New York, Spoil banks, *Landfills, *Federal government, Dredging, Disposal, Water pollution sources, Water pollution control, Waste disposal water quality control, Water policy, Administrative agencies, Dikes, Aquatic habitats. Identifiers: *Environmental Impact Statements, *Buffalo Harbor(NY).

This project involves construction and operation of a diked disposal area for containment of polluted maintenance dredge spoil. The containm structure would be at a site immediately south of the south entrance to the Buffalo Outer Harbor and adjacent to the Bethlehem Steel Corporation's Lachawanna plant. The site is a remote, relatively inaccessible area of little aesthetic, economic, or ecological importance. The polluted spoil, previ-ously dumped into another diked area and partially into the open waters of Lake Erie, will be confined in the diked area, thereby eliminating the adverse effects of polluted spoil in the lake and creating 107 acres of new land. Undesirable effects include increased turbidity during construction, unsightliness during construction and filling, and possible noxious odors. Other alternatives considered were continued open-lake disposal, improved methods of handling polluted spoil, abatement of pollution at its source, treatment of the polluted spoil, and disposal at alternate sites. 107 acres of surface water will be converted to land resulting in loss of limited fish habitat. There is no significant opposi-tion to this project. (Deckert-Florida)

PREVENTION OF POLLUTION OF MICHIGAN WATER RESOURCES, Detroit Dept. of Health, Mich.

J. G. Molner University of Detroit Law Journal, Vol 37, p 144-

*Michigan, *Water Descriptors: Descriptors: "Michigan, "Future planning(Projected), "Water utilization, "Regulation, "Legislation, Water policy, Water law, Water quality, Water repulvion control, Water supply, Water resources development, Recreation, Water treatment, Water supply development, Water conservation, Legal aspects, Planning, Law enforcement, Riparian rights, Reasonable use, Governmental interrelations, Inter-agency cooperation.
Identifiers: *Environmental policy.

Although Michigan is generally a 'water rich' state, problems of water quality and quantity have developed in some areas due to the varied use and

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over-use of nearby water resources. Because different water uses are not necessarily compatible, planning and regulation of the use of water resources is necessary. The common law doctrines resources is necessary. In common inw doctrines of riparian rights and reasonable use are presented and criticized as examples of long-standing water use doctrines. Michigan anti-pollution legislation is examined and some federal and local anti-pollution efforts are briefly discussed. In addition to the need for better planning, greater inter-agency cooperation, more effective enforcement powers, more adequate financing of water distribution and treatment facilities are necessary to preserve the quality and quantity of our natural water resources. (Deckert-Florida) W75-00932

PRETREATMENT GUIDELINES RELEASED BY EPA.
Pollution Control Guide, Vol 3, paragraph 19840, p

Descriptors: *Administrative agencies, *Federal Water Pollution Control Act, *Waste water disposal, *Water treatment, Treatment facilities, Adoption of practices, Federal government, State Adoption of practices, rederal government, state governments, Industrial wastes, Standards, Navigable waters, Water pollution, Water quality control, United States, Local governments, Permits, Technology, Administrative decisions, Water quality standards, Governmental interrelatives

Identifiers: FWPCA Amendments of 1972, *Administrative regulations.

Environmental Protection Agency has published guidelines to assist states and mu-nicipalities in developing pretreatment require-ments for industrial pollutants flowing into sewage treatment plants. The guidelines also explain the relationship between pretreatment and the effluent limitations for a publicly owned treatment works. Authority for these guidelines is contained in the 1972 Amendments to the Federal Water Pollution Control Act. The Act established a national system for preventing, reducing, and eventually eliminat-ing water pollution. The ultimate goal is to eliminate the discharge of pollutants into the navigable waters of the United States. Under the National Pollutant Discharge Elimination System all point sources must obtain a permit for the discharge of wastewaters to the navigable waters of the United States. All other point sources, other than publicly owned treatment works must treat their wastewaters by the application of the best practicable control technology. (Sperling-Florida) W75-00936

WATER QUALITY CRITERIA.

Pollution Control Guide, Vol 1, paragraph 501-523, p 511-519, 1973.

Descriptors: *Standards, *Water quality control, *Water pollution effects, *Water pollution stan-dards, Recreation, Wildlife conservation, Aquatic habitats, Measurement, Water supply, Navigable waters, Water law, Legal aspects, Public health, Shellfish, Shorelines, Beaches, Aesthetics, Groundwater, Water policy, Water quality stan-

Identifiers: Contiguous zone, FWPCA Amendments of 1972, *Administrative regulations.

Water quality standards classify each state's waters according to their use potential as recreation, fish and wildlife habitat, public water supply, agriculture, industry, or navigation. Water quality criteria specify minimum physical, chemical, and biological parameters necessary to support the designated use of a given stream. The 1972 Amendments to the Federal Water Pollution Control Act continues the requirement that each state. trol Act continues the requirement that each state establish water quality criteria which reflect the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare in-cluding effects on plankton, fish, shellfish, wildlife, plants, shorelines, beaches, aesthetics, and recreation. These criteria will refer to the presence of pollutants in any body of water including ground water. Information will also be published on the measurement and classification of water quality. (Sperling-Florida) W75-00937

WATER QUALITY STANDARDS.

Pollution Control Guide, Vol 1, paragraph 575-579, p 575-577, 1973. 3 p.

Descriptors: *Federal Water Pollution Control Act, *Standards, *Navigable waters, *Water quality control, State governments, Interstate, Administrative agencies, Adoption of practices, Water pollution, Water law, Environmental sanitawater poliution, water law, Environmental sanita-tion, Administration, Regulation, Legislation, Federal government, Water quality standards, Water policy, Water quality standards, Navigable waters, Governmental interrelations. Identifiers: FWPCA Amendments of 1972,

*Administrative regulations, State policy.

Under the Federal Water Pollution Control Act Amendments of 1972 water quality standards are to be established for all navigable waters. Each state is responsible for the establishment of standards for the navigable waters within its bounda-ries. These standards are subject to Environmental Protection Agency approval and where the state fails to take action the agency itself may promulgate standards. The adoption procedure contained in the act prior to the 1972 Amendments must be followed by the states with one exception, water quality standards are to be established for all the navigable waters within a state rather than just for the interstate waters within the state boundaries. Standards adopted before the Amendments still remain effective. Additional standards need to be established for interstate waters so that water quality standards will exist for all the nation's navigable waters. (Sperling-Florida) W75-00938

EPA NPDES PERMIT PROGRAM. Pollution Control Guide, Vol 1, paragraph 1500-1501, p 1503, 1511-1512, 1973.

Descriptors: *Permits, *Water pollution control, *Federal government, *Discharge(Water), *Regulation, Water quality standards, Legislation, Federal Water Pollution Control Act, Water Quality Act, Governmental interrelations, State governments, Water quality, Pollutants, Water law, Water quality control, Non-structural alternatives, Effluent, Water pollution sources, Industrial water, Water pollution, Administrative agencies,

Control.

Identifiers: *Administrative regulations, *FWPCA Amendments of 1972, *Effluents limitations, *Licenses, *Environmental Impact Statements, Refuse Act of 1899.

A brief historical and introductory correlator to the National Pollutant Discharge Elimination System (NPDES) is presented. The NPDES is the basic regulatory mechanism established by the Federal Water Pollution Control Act Amendments of 1972, and replaces and expands the Refuse Act Permit Program which had been established under the Refuse Act of 1899. As a national rather than strictly federal system of control, the NPDES permit program is administered by the Environmental Protection Agency (EPA) in cooperation with the individual state governments. The EPA NPDES permit program encompasses municipal, industrial, and under certain circumstances, agricultural discharges. Each permit will contain conditions which will insure compliance with appropriate which will insure compliance with appropriate water quality standards. However, the new program has eliminated the requirement that the EPA prepare a full environmental impact statement for each proposed permit. The statement is now required only for permits to be issued to new sources of pollution. (Deckert-Forida) W75-00939 STATE PARTICIPATION IN NPDES.

Pollution Control Guide, Vol 1, paragraph 1701-1723, p 1701-1748, 1973, 48 p.

Descriptors: *Federal Water Pollution Control Act, "State governments, "Administration, "Permits, "Administrative agencies, "Adoption of practices, Legal aspects, Economic aspects, Federal government, Environmental sanitation, Water law, Budget, Planning, Wells, Waste water disposal, Coordination, Governmental interrela-tions, Interagency coordination, Water policy, Identifiers: State policy, *Administrative regula-

The governor of any state intending to operate the National Pollutant Discharge Elimination System must receive the approval of the Environmental Protection Agency Administrator. He is required to approve any state program that meets the substantive, procedural, and resource requirements of the Federal Water Pollution Control Act. These guidelines aim toward establishing a permit pro-gram. Differences between state and federal programs are mainly designed to accommodate the Agency's review authority over the state program, and over all permits issued by the state. Substantive differences reflect not only state authority to issue permits for the disposal of pollutants into wells, but also the state's duty to coordinate per-mit conditions with the requirements of other state programs. Other elements of the state permit program include provisions for enforcement of the terms and conditions of permits, including adequate civil and criminal penalties, as well as sufficient resources and personnel. (Sperling-W75-00940

WATER REGULATIONS--CRITERIA STATE, LOCAL AND REGIONAL REMOVAL CONTIGENCY PLANS. FOR Pollution Control Guide, Vol 2, paragraph 8680-8686, p 9201-03, 1973. 3.

Descriptors: *Regulation, *Administrative agencies, *Oily waste, *Water pollution control, Coordination, Administration, Adoption of practices, Oil industry, Water pollution sources, Water quality control, Planning, Navigable waters, Great Lakes, Harbors, Shorelines, Public health, United States, Wildlife conservation, Aquatic habitats, State governments.
Identifiers: *Administrative regulations, Contiguous zone.

Criteria are presented to assist state, local, and regional agencies in the development of oil removal contingency plans. The plans will have reference to the inland navigable waters of the United States, coastal and contiguous zone waters, coastal and Great Lakes ports and harbors, as well as other areas chosen by the Environmental Pro-tection Agency and the Department of Transportation. The guidelines will promote timely, efficient, coordinated and effective action to minimize damage resulting from oil discharges. The plans will be directed toward the protection of the public health or welfare of the United States, including fish, shellfish, wildlife, public and private proper-ty, shorelines and beaches. Local and regional oil removal contingency plans will provide for the coordination of the total response to an oil discharge so that contigency organizations can operate independently or in conjunction with one another. (Sperling-Florida)

WATER REGULATIONS-DISCHARGE OF OIL. Pollution Control Guide, Vol 2, paragraph 8690-8699, p 9211-9212, 1973.

Descriptors: *Oil wastes, *Navigable waters, *United States, *Regulation, Shorelines, Water pollution sources, Environmental sanitation, Boats, Public health, Standards, Water law, Water

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quality control, Water pollution, International law, Oil industry, Waste water discharge, Oil pollution, Governmental interrelations, Federal government, Water quality standards, Adoption of practices. Identifiers: Administrative regulations, Con tiguous zone, Environmental policy, State policy.

These regulations apply to the discharge of oil into the navigable waters of the United States, adjoining shorelines or into the waters of the contiguous zone. Discharges of quantities of oil into navigable waters are harmful to the public health or welfare of the United States at all times, locations, and under all circumstances including discharges which violate applicable water quality standards or which cause a film on the surface of the water. No person shall discharge or permit to be discharged oil into the waters of the United States, adjoining shoreline, or contiguous zone except as may be permitted in the contiguous zone under Article IV of the International Convention for the Prevention of Pollution of the Sea by Oil. Discharges of oil from a properly functioning vessel engine are not deemed to be harmful, but such oil accumulated in a vessel's bilges shall not be so exempt. (Sperling-Florida) W75-00942

REGULATIONS--MARINE SANITA-TION DEVICE STANDARDS.
For primary bibliographic entry see Field 6E.

WATER REGULATIONS-TRANSPORTATION FOR DUMPING AND DUMPING OF MATERIAL INTO OCEAN WATERS.

Pollution Control Guide, Vol 2, paragraph 9100-9104, p 9471-9472, 1973.

Descriptors: *Water pollution, *Oceans, *Regulations, Waste water treatment, Water quality control, Sewage treatment, Waste disposal, Water quality, Refuse, Water law, Water quality standards, Water policy, Waste disposal, Regulation, Administrative agencies, Adoption of practices, Permits, Federal government, International

Identifiers: *Administrative regulations, *Coastal waters. *Territorial waters.

General provisions are presented of the water regulations relating to the transportation for dumping and the dumping of material into ocean waters. The act is the enabling legislation pursuant to United States commitments made by ratification of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter. The regulations included are based on provisions to be considered in the development of criteria governing the issuance of permits for the dumping of matter at sea. General, special, emergency and interim permits may be issued to control the dumping of certain materials, such as galley waste from ships or other non-toxic materials generally disposed of in small quantities. Regional Adminis trators of the Environmental Protection Agency or their designees have the authority to initiate and carry out enforcement proceedings and to issue, deny, or impose conditions on special and interim permits. Sections relate to the designation of new disposal sites and Corps of Engineer permits. (Sperling-Florida) W75-00944

REGULATIONS--INTERSTATE PROPOSED WATERS OF STATE OF ALABAMA.
Pollution Control Guide, Vol 3, paragraph 10621, p 11311-11315, 1973.

Descriptors: *Navigable waters, *Water quality standards, *Federal government, *Administrative agencies, *Alabama, State governments, Govern-mental interrelations, Water law, Water pollution control, Pollutants, Water quality, Toxicity, Federal Water Pollution Control Act, Water Quali-

ty Act, Regulation, Water quality control, Water pollution effects, Non-structural alternatives, Water policy, Water resources development. Identifiers: *Administrative regulations, FWPCA 1972, policy. Environmental policy.

Regulations are proposed by the Environmental Protection Agency, pursuant to section 10(c)(2) of the Federal Water Pollution Control Act, as amended, that set forth water quality standards to be applicable to the interstate waters of the state of Alabama. These proposed standards are in addition to existing water quality standards established by Alabama and approved by the EPA. Where these proposed regulations are inconsistent with existing standards, the existing standards shall be superceded to the extent of the incon-sistency. The proposed regulations list specific interstate navigable waters to which the regulations shall apply, and include provisions pertaining to antidegradation, temperature levels, dissolved oxygen concentration, bacteria and radioactivity levels, turbidity, toxicity, and waste treatment requirements. The existing state plan of implementation would remain in effect until and unless revised pursuant to procedures set forth in the proposed regulations. (Deckert-Florida) W75-00945

PROPOSED **REGULATIONS--NAVIGABLE** WATERS OF STATE OF WEST VIRGINIA. Pollution Control Guide, Vol 3, paragraph 10622, p 11317-11319, 1973.

Descriptors: *West Virginia, *Federal Water Pollution Control Act, *Standards, *Regulation, Water law, Federal government, State governments, Interstate, Coordination, Adoption of practices, Water quality control, Administrative agencies, Administration, Water pollution, Water quality, Navigable waters, Water quality standards, Interagency cooperation. Identifiers: FWPCA Amendments of 1972, *Administrative regulations, State policy.

Proposed water quality standards, issued pursuant to the Federal Water Pollution Control Act, are presented. These standards will be applicable to the navigable waters of the state of West Virginia. The Administrator of the Environmental Protection Agency is required to review standards for interstate and intrastate waters submitted by the states. If changes are required he must notify the state. If the state does not adopt the required revisions or if the revisions do not meet the requirements of the Act, the Administrator is to publish proposed revised water quality standards in accordance with such requirements. The state of West Virginia adopted water quality standards prior to the 1972 Amendments to the Act. The state was notified of the required revisions, but did not formally submit those revisions within the ninety day period allowed by the Act. The agency has thus proposed alternative complying stan-dards. (Sperling-Florida) W75-00946

REGULATIONS--NAVIGABLE WATERS OF THE STATE OF NEW JERSEY.
Pollution Control Guide, Vol 3, paragraph 10624, p 11321-11323, 1974.

Descriptors: *Federal Water Pollution Control Act, "New Jersey, "Regulation, "Administrative agencies, "Adoption of practices, Coordination, Administration, Water pollution, Water quality control, Water law, Standards, Environmental sanitation, Water conservation, State governments, Federal government, Water quality standards, active and the statements of the statement of dards governmental interrelations. Identifiers: *Administrative regulations, FWPCA Amendments of 1972, State policy.

Proposed regulations set forth standards of water quality applicable to the navigable waters of the

state of New Jersey pursuant to the Federal Water Pollution Control Act (FWPCA). The Administrator of the Environmental Protection Agency is required to review standards submitted by the status for interstate and intrastate waters. changes are needed he must notify the state. If the state does not adopt the revisions the FWPCA provides for publication of revised water quality standards in accordance with such requirements. The state of New Jersey had adopted water quality standards prior to the enactment of the 1972 Amendments to the FWPCA. The state was notified of required revisions in their standards, but has not formally submitted the required revisions within the ninety day period allowed by the FWPCA. Accordingly, the Administrator has promulgated the proposed changes. (Sperling-Florida)

PROPOSED **REGULATIONS--NAVIGABLE** WATERS OF THE STATE OF NEW YORK.
Pollution Control Guide, Vol 3, paragraph 10625, p

Descriptors: *New York, *Federal Water Pollution Control Act, *Regulation, *Standards, *Water quality control, Water resources, Administrative agencies, Adoption of practices, Navigable waters, State governments, Thermal pollution, Water quality standards, Water quality, Federal

government.
Identifiers: *Environmental policy, Administrative regulations.

Proposed regulations issued pursuant to the Federal Water Pollution Control Act setting forth standards of water quality applicable to the navigable waters of the State of New York are presented. The Administrator of the Environmental Protection Agency is required to review water quality standards for interstate and intrastate waters submitted by the states. When he deterwaters submitted by the states. When he deter-mines changes are required he must notify the state. If the state doesn't adopt the revisions the Administrator is to publish proposed revised water quality standards. Standards have been proposed covering water temperatures, analytical testing procedures, dissolved oxygen concentrations, dissolved solids, bacterial quality, color, turbidity, taste and odor. The Administrator made the proposed regulations because the state did not submit the required revisions within the ninety day period allowed. (Sperling-Florida) W75-00948

PROPOSED PROPOSED REGULATIONS--NAVIGABLE WATERS OF THE STATE OF OHIO. ollution Control Guide, Vol 3, paragraph 10627, p 11328-11330, 1974

Descriptors: *Ohio, *Adoption of practices, *Water quality, *Administrative agencies, *Water quality, *Administrative agencies, *Standards, State governments, Federal govern-*Standards, State governments, Federal govern-ment, Interstate, Federal Water Pollution Control Act, Minerals, Water resources, Water quality control, Administration, Coordination, Navigable waters, Water quality standards. Identifiers: Federal Water Pollution Control Act Amendments of 1972, *Administrative regula-tions, State policy.

Regulations setting forth water quality standards applicable to the state of Ohio issued pursuant to the Federal Water Pollution Control Act are proposed. The Administrator of the Environmental Protection Agency is required to review standards established and submitted by the states. When he determines that revisions are necessary, he notifies the state. If the state doesn't meet the requirements of the Act the Administrator may requirements of the Act the Administrator may publish proposed revised water quality standards in accordance with those requirements. The state of Ohio adopted standards for interstate and intra-state waters. After the 1972 Amendments to the Act, the agency reviewed the standards and

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notified the state of needed revisions. The state of Ohio, in response to the agency, revised its standards. Upon further review those standards have been found to be consistent with the law except as noted. Further revision was needed for some mineral concentrations. (Sperling-Florida) W75-00949

PROPOSED REGULATIONS--THERMAL DISCHARGES.

Pollution Control Guide, Vol 3, paragraph 10635-10636, p 11361-11373, 1974.

Descriptors: *Federal Water Pollution Control Descriptors: "Federal Water Pollution Control Act, "Adoption of practices, "Standards, "Regulation, Administrative agencies, Administration, "Thermal pollution, Waste water disposal, Water law, Water quality control, Coordination, Water pollution, State governments, Federal government, Water quality standards. Identifiers: FWPCA Amendments of 1972, Administrative results in the property of the p

ministrative regulations.

The Administrator of the Environmental Protection Agency pursuant to the Federal Water Pollu-tion Control Act has proposed procedures for the imposition of alternative effluent limitations. This is for the control of the thermal component of a discharge to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made. The proposed regulations establish substantially procedures for the imposition of alternative ef-fluent limitations by the Administrator or by the director of a state water pollution control agency. Determinations by a state will be made when the state is participating in the National Pollution Discharge Elimination System pursuant to a state program approved by the Administrator. (Sperling-Florida) W75-00950

PROPOSED REGULATIONS--WATER PRO-GRAM-PROPOSED TOXIC POLLUTANT EF-FLUENT STANDARDS. Pollution Control Guide, Vol 3, paragraph 10681-

10682, p, 11551-11566, 1974.

Descriptors: *Federal Water Pollution Control Toxic substances, *Standards, *Effluents, Environmental effects, Aesthetics, Water supply, Recreation, Administration, Adoption of practices, Waste water disposal, Farm wastes, Industrial wastes, Consumptive use, Water conserva-tion, Water quality standards, Water quality con-Administrative decisions, Administrative

Identifiers: FWPCA Amendements of 1972, Administrative regulations.

The Environmental Protection Agency, pursuant to the Federal Water Pollution Control Act and the 1972 Amendments, is setting forth proposed effluent standards for toxic pollutants. The four basic factors considered in setting the standards were toxicological data, hydrodynamic data, ample safety margins and calculations of the acute and chronic limitations for the standards. The toxicity of the pollutants on the list, their persistence, degradability, the usual or potential presence of the affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of the toxic pollutant on such organisms, were considered in the establishment of the Water Quality Criteria upon which these standards are based. Water Quality Criteria published pursuant to the Act are those concentrations which are acceptable in the receiving water body. The criteria were developed to protect in-dustrial, agricultural, recreational water uses and (Sperling-Florida) W75-00951 GOVERNMENTAL REORGANIZATION FOR NATURAL RESOURCES PROTECTION. For primary bibliographic entry see Field 6E. W75-00957

BEGINS COMPLIANCE WITH 1972 AMENDMENTS.

Journal Water Pollution Control Federation, Vol 45, No 9, p 1843-1844, Sept. 1973.

Descriptors: *Industrial effluents, *Industrial plants, *Waste water treatment, *Water quality control, *Federal Water Pollution Control Act, Water quality, Water law, Water pollution, Water pollution sources, Industrial use(Water), Industrial wastes, Sewage treatment, Wastes, Industrial plants, Waste water, Waste water treatment, Administrative decisions, Administration, Adoption of practices, Environmental effects.
Identifiers: *Effluent limitations, *Administrative

The Environmental Protection Agency (EPA) announced effluent guidelines for the sugar beet processing and fiber manufacturing industries as partial fulfillment of its obligation under the 1972 Federal Water Pollution Control Act (FWPCA). FWPCA requires that by July 1977, every industrial discharger must meet effluent limitations defined as the 'best practical control technology currently available.' The guidelines developed and issued for these two industries are atypical in that each industry is relatively small, basic analysis was carried out by the EPA and not by contractors, and in both industries, a requirement of no discharge of pollutants has been established. Six existing fiber glass plants have achieved the no discharge requirement. The proposed 1977 standards for sugar beet processing state that, where suitable land is available and owned by the refinery, no discharge of pollutants will be allowed. The 1972 amendments require that publicly owned waste water treatment plants achieve secondary treatment by 1977. The EPA also issued regulations requiring industries to reimburse local governments in proportion to the industries' use of the municipal treatment facilities financed by federal grants. Municipalities must establish an industrial recovery process. An index of sewerage facility construction costs is included. (Sperling-Florida) W75-00958

NORTH CAROLINA'S WATER POLLUTION CONTROL PROGRAM, PART I: AN OVER-VIEW OF THE PROBLEM, M. S. Heath, Jr.

Popular Government, Vol 39, p 13-15, Oct 1972.

Descriptors: *North Carolina, *Legislation, *Water quality control, *Government finance, *Treatment facilities, Construction, Water supply, Water law, Environmental sanitation, Measurement, Waste water disposal, Design standards, Waste water treatment, Oily wastes, Southeast US, Interstate compact, Enforcement, Administration, Adoption of practices.
Identifiers: *Administrative regulations

Many new water quality laws were enacted in North Carolina during 1971. Included in the laws was the first stateaid appropriation for local was the first stateau appropriation for following sewage treatment plants. A \$150 million Clean Water Bond issued to provide additional state aid to both water supply and sewage treatment systems will go before the voters. Pollution control monitoring and reporting requirements were strengthened. There will be regional sewage disposal and water supply laws providing state planning advances and staff assistance to regional programs. The State Board of Health has been given authority to set minimum standards for all given authority to set minimum standards for any public water supply systems, including design and construction in regard to oil drilling and water-craft. North Carolina is a member of the Southeastern Regional Environmental Compact. (Sperling-Florida) W75-00960

COMMONWEALTH V. BARNES AND TUCKER CO. (MINE WATER DISCHARGE PERMIT For primary bibliographic entry see Field 6E. W75-00961

QUARLES ADVISES REGIONAL ADMINIS-TRATORS ON WATER PROGRAMS. Pollution Control Guide, Vol 3, paragraph 19843, p 19561-19565, 1974. 5 p.

Descriptors: *Administrative agencies, *Administration, *Coordination, *Regulation, Budget, Economic aspects, Adoption of practices, Planning, State governments, Federal government, Legislation, Permits, Environmental sanitation, Environmental effects, Water law, Interagency cooperation, Water policy. Identifiers: *FWPCA Amendments of 1972, *Administrative regulations.

A memorandum from Environmental Protection Agency Administrator John Quarles to regional administrators concerns fiscal year 1975 state water programs. Fiscal year 1974 was the first year in which state programs were developed under Section 106 of the Federal Water Pollution Control Act Amendments of 1972. Regions and states worked together to produce state strategies. Regional administrators and state agency heads met to establish program commitments, and to project priority criteria and systems responses to the concepts of the new law. Planning efforts in 1974 involved submission and approval of each state's continuing planning process. It focused on seg-ment analysis and waste load analysis in order to provide as broad a basis as possible for issuing meaningful permits. The waste load analysis effort was considered so important that \$4.2 million was diverted to the states. (Sperling-Florida)

TION AND DRAINAGE: PROGRESS, PROBLEMS, AND OPPORTUNITIES. For primary bibliographic entry see Field 4A. W75-00964

LIMNOLOGICAL GUIDANCE FOR FINGER

LAKES MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Natural
Resources; and New York State Coll. of Agriculture and Life Sciences, Ithaca.

R. T. Oglesby.

Available from the National Technical Informa-Avauaue from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-237 160, \$3.25 in paper copy, \$2.25 in microfiche. Technical Report 89. Cornell University Water Resources and Marine Sciences Center, September 1974. 17 p, 3 tab, 6 ref. OWRR A-047-NY(1). 14-31-0001-4032.

Descriptors: *Limnology, *Lakes, *Management, *Water quality control, *New York, Algal control, Summer, Rooted aquatic plants, Fish, Phosphorus.

Identifiers: *Finger Lakes(New York).

The Finger Lakes represent a great value to the people of New York State, economically as well as socially and environmentally. The lakes have positive climatic effects on the land surrounding them, and they provide vital water supplies for a variety uses in the cities outside their basins Despite their value, the quality of these waters has received very little attention until recently. As part of a growing interest in maintaining the integrity of lakes, this report provides guidelines for developing water quality management strategies for the Finger Lakes. Major emphasis is on the control of algae levels during the summer months. The problem of rooted plant growth is discussed

Group 5G-Water Quality Control

briefly as is the relation of the production of plants to that of fish. The report is written as an aid to groups of citizens and public officials who possess both a concern for the Finger Lakes and a desire to explore alternative courses of action to preserve or improve their quality. Scientific terms are avoided as much as possible and explained in the text when their use is necessary. Among the conclusions reached, it is found that algae concentrations appearing during summer are controlled primarily by inputs of phosphorus. (Bell-Cornell) W75-00971

URBAN RUNOFF QUALITY AND MODELING

Nebraska Univ., Lincoln. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B.

REHABILITATION OF STREAMS RECEIVING

ACID MINE DRAINAGE,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies. For primary bibliographic entry see Field 5C. W75-00979

NATIONAL WATER COMMISSION: A REVIEW OF SOME ISSUES, PROCEEDINGS OF A SEMINAR SERIES,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 6E. W75-00981

PROGRAMS AND PROSPECTS FOR WATER POLLUTION CONTROL,

North Carolina Water Resources Research Inst.,

Raleigh. D. H. Howells.

In: National Water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 39-52, July, 1974.

Descriptors: *Water pollution control, Treatment facilities, *National Water Commission, *Federal Water Pollution Control Act, *Water Quality Act, Planning, Evaluation, Water quality standards, Abatement.

Identifiers: *Zero discharge, *Waste discharge permit system, *Waste management, Stream classification, Stream utilization, Environmental Protection Agency.

The drafting of recommendations on water pollution control by the National Water Commission (NWC) occurred simultaneously with and was in-fluenced by congressional deliberations on the 1972 amendments to the Federal Water Pollution Control Act (FWPCA). While there are many areas of agreement between the Commission report and the Act, there are sharp differences with respect to national goals. The NWC feels that the Act's national goal of zero discharge by 1985 is lofty and unwarranted, but that the lesser interim goals are potentially workable and consistent with NWC recommendations. Specifically, the NWC recommended: (1) water pollution control to protect water quality standards, (2) sufficiently high standards to protect all existing uses and reasonable future uses, (3) a national water pollution con-trol program, within 10 years, sufficient to achieve water quality standards, (4) the user pay principle through adoption of service charges, (5) water quality standards through a national waste discharge permit system, (6) primary responsibility to states for water pollution control, (7) expansion of planning, program evaluation, and monitoring, (8) greater discretionary authority to EPA to encourage alternatives to accomplish objectives at lower cost, and (9) regional waste management agencies. Comprehensive water pollution control

planning and management and trends in water pollution control data are discussed briefly. (See also W75-00981) (Diefendorf-North Carolina)

STRIP-MINE REGULATION AND RECLAMA-TION: AN ATTITUDE SURVEY, Clarkson Coll. of Technology, Potsdam, N.Y.

Dept. of Economics. For primary bibliographic entry see Field 6B. W75-01028

APPARATUS FOR GRAVITY SEPARATION OF IMMISCIBLE FLUIDS, Pineville Kraft Corp., La. (assignee)

For primary bibliographic entry see Field 5D. W75-01031

SURFACE TENSION METHOD OF AND AP-PARATUS FOR SEPARATING IMMISCIBLE

TRW Inc., Redondo Beach Calif. (assignee) P. G. Bhuta, R. L. Johnson, and D. J. Graham. U.S. Patent No 3,831,756, 7p, 12 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 925, No 4, p 1240, August 27, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Equipment, Surface ten-*Separation techniques, Equipment, Screens.

A liquid separation apparatus is described for separating, with a surface tension liquid screening action, a selected liquid from a second liquid in which the selected liquid is immiscible. The invention is concerned with an oil recovery apparatus for removing and recovering oil from the surface of water. A surface tension oil-water separator is filled with oil and supported by means of a float, such that the separator floats at the water surface. The oil is pumped from the separator chamber into a collection chamber, as the screen pressure regu-lating system permits, thereby maintaining a pres-sure differential less than the critical pressure dif-ferential required to force water through the separator screen into the separator chamber. Any oil which contacts the outside (waterside) of the screen is drawn through the latter into the separator chamber from which the oil is pumped to the collection chamber. The preferred forms of the oil recovery apparatus embody a stilling basin with a surface skimmer inlet through which surface water and oil enter the basin and an outlet through which water is discharged from the basin. (Sinha-OEIS) W75-01034

ACTIVATED CARBON CHEMICAL ADSORP-TION ASSEMBLY, Carborundum Co., Niagara Falls, N.Y. (assignee) J. Economy, and R. Y. Lin. U.S. Patent No. 3,831,760, 7 p, 12 fig, 2 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 925, No 4, p 1241, August 27, 1974.

Descriptors: *Patents, *Activated carbon, *Water quality control, *Water pollution control, *Pollution abatement, Chemical wastes, Adsorp-

Identifiers: Chemical spills

Activated carbon textile is provided with a buoyant member (floating support) and a sinking weight, for use in controlling chemical spillage on commercial waterways such as rivers, lakes, oceans and other bodies of water. The activated carbon chemical adsorption assembly can be constructed in configurations which are essentially one dimension, two dimensional, or three dimensional, with various degrees of dimensional stability. Chemical spillage is preferably controlled by the use of a combination of various embodiments, which differ as to convenience and effectiveness, with the more convenient configurations being somewhat less effective, and the more effective configurations being somewhat less convenient to use. (Sinha-OEIS) W75-01036

APPARATUS FOR SALVAGING OIL FROM SUNKEN VESSELS, Salvage Oil Systems Ltd., Edmonton (Alberta).

(assignee) J. Rolleman.

U.S. Patent No. 3,831,387, 7 p, 25 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 925, No 4, p 1141, August 27, 1974.

Descriptors: *Patents, *Oil pollution, *Water quality control, *Water pollution control, *Oil spills, Equipment.
Identifiers: *Salvage, Sunken vessels.

Removal of oil from a sunken vessel is obtained by use of a remotely controlled submersible 'pumphouse' or salvage capsule which performs all the necessary functions to gain access to, and remove to the surface, oil contained in the sunken vessel. The essential features include remotely controlled means on and within the salvage capsule for ef-fecting the necessary functions including: means for securely but detachably fixing the capsule in the decking or hull of the vessel in proximity to the compartment from which the oil is to be salvaged; a drill for providing access to the compartment through one or more openings; an extensible oil suction pipe for insertion into the compartment through the opening; one pump for removing oil from the ship compartment into a holding chamber within the capsule and a second pump for removing oil from the holding chamber to the surface where it may be held in suitable storage such as balloons or salvage tankers. (Sinha-OEIS) W75-01038

COMPOSITION OF MATTER FOR CON-TROLLING OIL POLLUTION AND PREFERABLY OIL DISCHARGE IN WATER, Kritbruksbolaget i Malmo A.B. (Sweden). (assignee) L. E. Stern.

U.S. Patent No 3,812,973, 3 p, 3 ref; Official Gazette of the United States Patent Office, Vol 922, No 4, p 1138, May 28, 1974.

Descriptors: *Patents, *Oil pollution, Water quality control, *Pollution abatement.
Identifiers: *Paraffin, *Polyethylene, Fibers.

A new floating-type oil pollution controlling agent which per unit of weight takes up a large amount of oil consists of fibers of a mixture of polyethylene and paraffin. The paraffin and polyethylene are present in a preferred ratio of from about 50:50 to about 60:40. (Sinha-OEIS) W75-01043

OIL SPILL RECOVERY,

Gulf Research and Development Co., Pittsburgh, Pa. (assignee)

Pa. (assignee)
B. H. Clampitt, K. E. Harwell, and J. W. Jones, Jr.
U.S. Patent No 3,819,514, 8 p, 1 fig, 6 tab, 3 ref;
Official Gazette of the United States Patent Office, Vol 923, No 4, p 1491, June 25, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Foam separation, Water quality control, Equipment, Ethylene-alkyl acrylate copolymer, Separation techniques, Treat-

A method for the selective removal of oil from water surfaces consists of the steps of spreading a foam of an ethylene-alkyl acrylate copolymer hav-ing a melt index of at least 800 on the oil on the water surface, allowing the foam to selevtively absorb oil from the water surface, and thereafter gathering and collecting the foam with the ab-

WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

sorbed oil from the water surface. Ethylene-alkyl acrylate is a copolymer of ethylene and methyl acrylate. The copolymer has a melt index in the range of from about 1,000 up to about 2,500 and methyl acrylate is present in copolymer in an amount of from about 15 up to about 45 weight percent. (Sinha-OEIS) W75-01044

FLOATING BARRIER, Submarine Engineering Associates, Inc., Cohas-

R. A. Benson

U.S. Patent No 3,818,708, 6 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1287, June 25, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Equipment, Barriers, Separation techniques.

A floating barrier designed to contain an oil spill, comprises a solid vertical dam with floats extending laterally from opposite sides of the dam. The floats, taken together, are of overall width between one-fourth and two-thirds the height of the dam and greater than their own height. The dam is made of polyurethane material and has an increased average weight density in its lower 20 percent. The floats are D-shaped foam filled tubes which extend the length of the barrier section to provide maximum strength and continuity. In addition, there are vertical stiffening ribs of less flexibility than the dam to provide rigidity; adjacent sections are hinged to each other with plastic pins. The buoyancy and weight of the barrier are related so that in water at least 50 per cent of the height of the floats will be submerged. (Sinha-OEIS) W75-01049

THE EFFECT OF CHLORINATING HYDROCOOLING WATER ON MONILINIA FRUCTICOLA CONIDIA AND BROWN ROT, OF Agricultural Research Service, Fresno, Calif. Horticultural Crops Marketing Lab. For primary bibliographic entry see Field 5C. W75-01053

FISH HEALTH: A NATIONWIDE SURVEY OF PROBLEMS AND NEEDS, Bureau of Sport Fisheries and Wildlife, Washing-ton, D.C. Div. of Fishery Research. F. E. Hester.

Prog Fish-Cult. Vol 35, No 1, p 11-18. 1973. Identifiers: Bacteriology, *Fish health, Parasitology, *Surveys, Virology, *Public health, Research

This study was carried out to locate the available diagnostic capability and to learn the fish health research supported by state and commercial or-ganizations. The survey discusses bacteriological, parasitological, viral and miscellaneous health problems.—Copyright 1974, Biological Abstracts, Inc. Inc. W75-01067

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

STOCHASTIC MODEL FOR A DYNAMIC ECOSYSTEM. Virginia Polytechnic Inst. and State Univ., Blacksburg Dept. of Statistics. For primary bibliographic entry see Field 5B. W75-00559

ble to the planner or engineer for developing water and related land resources are reviewed. The areas of primary interest are the socio-economic aspects of planning, land-use analysis, water supply, wastewater management, urban hydrological processes, and recreation planning. Several

DEVELOPMENT OF A FLOOD AND POLLU-TION CONTROL PLAN FOR THE CHICAGO-LAND AREA, COMPUTER SIMULATION PRO-

Chicago Dept. of Public Works, Ill. Bureau of Engineering. For primary bibliographic entry see Field 5B. W75-00561

A METHOD FOR EVALUATING WATER RESOURCES FOR URBAN PLANNING, Geological Survey, Reston, Va. Urban Water Program. For primary bibliographic entry see Field 6B. W75-00639

A NUMERICAL SIMULATION MODEL FOR SNOW STORAGE IN SMALL COASTAL BASINS, SOUTHWESTERN BRITISH COLUM-BIA, McMaster Univ., Hamilton (Ontario). Dept. of

Geography.
For primary bibliographic entry see Field 2C. W75-00883

QUARLES ADVISES REGIONAL ADMINIS-TRATORS ON WATER PROGRAMS. For primary bibliographic entry see Field 5G.

A REFINED COMPUTATIONAL ALGORITHM FOR A CLASS OF DYNAMIC PROGRAMMING PROBLEMS WITH APPLICATIONS TO THE SNAKE-COLUMBIA RIVER BASIN, Washington State Univ., Pullman. Dept of Computer Science.
For primary bibliographic entry see Field 4A. W75-00967

SURFACE RUNOFF SIMULATION MODEL. Nebraska Univ., Lincoln. Dept. of Civil Engineer-For primary bibliographic entry see Field 2A. W75-00969

REGIONAL ANALYSIS FOR DEVELOPMENT PLANNING IN DISASTER AREAS,
Cornell Univ., Ithaca, N.Y. Center for Urban
Development Research.
For primary bibliographic entry see Field 6G.

MODELS AND METHODS APPLICABLE TO CORPS OF ENGINEERS URBAN STUDIES, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. J. W. Brown, M. R. Walsh, R. W. McCarley, A. J. Green, Jr., and H. W. West. Miscellaneous Paper H-74-8, U.S. Army Engineer Waterways Experiment Station, Hydraulics Laboratory, Vicksburg, Miss., August 1974. 420 p, 1 tab, 100 ref, append.

Descriptors: *Water resources development, *Computer models, *Simulation analysis, *Model studies, *Methodology, *Projects, Land resources, Economics, Social aspects, Hydraulics, Hydrology, Evaluation, Equations, Comprehensive planning, Reservoir operation, Flood routing, Optimization, Systems analysis, Water overlity. quality. Identifiers: Urban development, Systems dynam-

Methods and computer simulation models availa-

methods and models are recommended as being potentially useful in urban studies, based on such factors as technical content, input data required. recisions as technical content, input data requires existence of previous application, general availability, potential cost, etc. General summaries of the field of urban planning, along with some recommendations to the planner, are given. The particular models and methods dealing with specific topics are summarized in special format in the Appendix, which also presents a list of institu-tions active in urban planning. (Bell-Cornell) W75-01001

A METHODOLOGY FOR PLANNING LAND USE AND ENGINEERING ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT: THE FLOOD PLAIN MANAGEMENT SYSTEM MODEL

Arizona Univ., Tucson. For primary bibliographic entry see Field 6F. W75-01002

6B. Evaluation Process

A METHOD FOR EVALUATING WATER RESOURCES FOR URBAN PLANNING, Geological Survey, Reston, Va. Urban Water Pro-

gram. D. A. Rickert, W. J. Schneider, and A. M. Spieker. In: Short Papers of the Eighth American Water Resources Conference, St Louis, Missouri, October 30-November 2, 1972: American Water Resources Association Proceedings Series No 16,

Descriptors: *Planning, *Data collections, *Water resources, *Urban hydrology, City planning, Decision making.
Identifiers: Urban planning, Data requirements.

A water-resource evaluation matrix provides a means for determining the relative importance of water-related problems, and for identifying the data needed to evaluate these problems for the purpose of urban planning. The matrix columns list nine subject categories in which water-related urban problems may occur. The matrix rows list possible types of data inputs to evaluate the waterresource problems. The inputs include the stan-dard type of basic hydrologic data as well as information based on interpretation and analysis of these data. In addition to water resource items, the list includes inputs on the interfacing factors of climate, land, and culture. The relative importance of problem categories and data inputs are ranked on a numerical scale. From this, an index is derived that assesses the relative importance of each data item to the overall program. From the completed matrix, the hydrologist can determine the availability of data to meet the identified requirements. Determination can then be made as to priorities on work elements which will provide the planner with maximum information in minimum time (Knapp-W75-00639

GROUND WATER IN PERSPECTIVE, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W75-00640

A MEASURE OF OUTDOOR RECREATIONAL USAGE, Florida Univ., Gainesville, Dept. of Food and

Resource Economics. K. C. Gibbs.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 062, \$4.25 in paper copy, \$2.25 in microfiche. Institute of Food and Agricultural Sciences, Economic Report 52, August 1974. 51 p, 3 fig, 10 tab, 14 ref, append. OWRT B-007-FLA(10), 14-31-0001-3267.

Field 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, Decision making, Recreation, *Recreation demand *Florida, *Estimating, Methodology, Economics. Identifiers: *Kissimmee River basin(Fla). *Recreation demand,

This report concentrates on the total and seasonal use and certain economic aspects of outdoor recreation in the Kissimmee River Basin. The objectives were: (1) to apply a methodology to estimate the number of people who use the Kissim-mee River Basin for recreational purposes and (2) to estimate the relationship between recreational use and certain climatological variables, including water level, in the Kissimmee River Basin during 1970. Total recreational usage, in a given time period, can be defined as the product of the number of days a recreationist uses a recreational site per visit and the number of visits to a recreational site, per time period. The analysis of calculating the days/visit is the topic of another study. Data gathered from traffic counters and from overflights of the Kissimmee River Basin were utilized to establish the total number of visits per season and for the year. Other variables, such as water level, temperature, wind velocity, and rainfall, were obtained in order to determine their relationship to visitations. This relationship is desirable in order to predict visitations more accurately. (Morgan-Florida) W75-00694

REVIEW REPORT ON THE COLUMBIA--NORTH PACIFIC REGION CONPREHENSIVE FRAMEWORK PLAN (FINAL ENVIRONMEN-TAL IMPACT STATEMENT).

Pacific Northwest River Basins Commission, Van-

Available from National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va. 22161, as EIS-AA-73-1949-F, \$10.25 in paper copy, \$2.25 in microfiche. December 1972. 158 p, 1 fig, 3 tab, 3 append.

Descriptors: *Columbia River, *Interstate waters, *Comprehensive planning, *Water management(Applied), *Adminstrative agencies, Coordination, Navigable waters, Rivers, Water quality, Water quality control, Electric powerplants, Competing uses, Fish management, Flood control, Project planning, Recreation, Water conservation, Water demand, Natural watercourses, Forest watersheds, Fish and wildlife, Analytical techniques, Water resources, Pacific Northwest United States, Water resources development, Wildlife conservation, Environmental effects, Water Washington, Oregon, Idaho, Montana, Identifiers: State policy, *Environmental impact

statements.

A framework of information is provided upon which a comprehensive plan for management of water and related land resources may be founded Described are the natural environment, resources, people, and economy of Columbia-North Pacific Region, and their projected problems and needs. Recommendations are presented for implementation of remedies for those problems. Recommendations are forwarded for the purposes of preservation and enhancement of environmental and aesthetic values, provision of adequate electric power form hydroelectric plants, water transportation improvement, improvement of water quality, providing adequate water supply to satisfy growing demand, flood control, food and fiber production, fish and wildlife needs, water-related recreation, and watershed management. The study highlights a number of areas where further indepth study is required. Appended are letters of assessment of the report from state and federal agencies pointing out alleged errors or adding further supporting data on specific proposals. (Salley-Florida) W75-00733

A REFINED COMPUTATIONAL ALGORITHM FOR A CLASS OF DYNAMIC PROGRAMMING PROBLEMS WITH APPLICATIONS TO THE SNAKE-COLUMBIA RIVER BASIN, Washington State Univ., Pullman. Dept of Comnuter Science

For primary bibliographic entry see Field 4A. W75-00967

A MODEL FOR SIMULATING RIVER AND RESERVOIR TEMPERATURES WITH APPLICATIONS FOR ANADROMOUS FISH MANAGEMENT, Oregon State Univ., Corvallis. Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 5C. W75-00978

WATER-RELATED AESTHET PREFERENCES OF WYOMING RESIDENTS, **AESTHETIC** Wyoming Univ., Laramie. Water Resources

Research Inst.
G. D. Hampe, V. E. Smith, and J. P. Mitchell.
National Technical Info Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 279, \$5.25 in paper copy, \$2.25 in microfiche. Completion Report Water Resources Series No. 46, (1974). 111 p, 25 tab, 16 ref. 3 append. OWRT A-018-WYO(1), 14-31-0001-4051.

Descriptors: *Aesthetics, *Attitudes, *Social values, Human population, Psychological aspects, Motivation, Recreation, *Scenery, *Wyoming.

The water-related aesthetic values of 237 individuals are analyzed. This study is one of the first to use color photographs on a general popula-tion. Important differences were found by age and educational level. The Types of scenes preferred most frequently as first and second for both the best-liked and least-liked groups were Type III (Moving water) and Type IV (Mountains and water). The Type chosen last in both the best-liked and least-liked groups was Type V (Water, man-made objects). Individuals who were age 56 and over did not look as disfavorably upon those scenes that showed man-made structures or people (Types V and VI, respectively) in them. The older age group did rank the Types in essentially the same order as the younger age groups did. Lower educated groups also did not view these same Types (V and VI) as negatively as did those who had completed high school and/or above, i.e., the younger generation. Social factors were found to have a slight, but significant influence upon the individual's choice, i.e., age, educational level, years of residence in Wyoming and section of country where the respondent was raised were found to explain about 10% of the variation in the prediction of each Type. W75-00980

NATIONAL WATER COMMISSION: A REVIEW OF SOME ISSUES, PROCEEDINGS OF A SEMINAR SERIES,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 6E. W75-00981

THE NATIONAL WATER COMMISSION: AN OVERVIEW OF ITS STRUCTURE AND IN-VOLVEMENT, Black and Veatch Consulting Engineers, Washing-

ton Regional Office, Washington, D.C For primary bibliographic entry see Field 6E. W75-00982

URBAN WATER RESOURCES PLANNING AND MANAGEMENT.

MARAGEMENT,
North Carolina Univ., Chapel Hill. Dept. of City
and Regional Planning.
M. M. Hufschmidt.

In: National Water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 9-21, July, 1974. 3 ref.

Descriptors: *National Water Commission, *Water policy, *Water resources development, *Planning, Land use, Land management, Domestic water, Urbanization, Water Resources Planning Act.
Identifiers: *Urban-metropolitan scale, *Urban

water management, National policies, Local policies, Flood plain management, Environmental im-provement, Urban water data.

Historically, there have been two major areas of U.S. water policies, plans, and programs. One is national, which developed around concerns for interstate commerce, navigation, major flood control projects and irrigation developments. Alongside this national emphasis has been consistent local concern for domestic water supply, sewage collection, treatment and disposal, and urban storm drainage. In the past, policy recommenda-tions implemented have been rural-resource, rather than urban oriented. With the growing urbanization trend, national water policy for the next two decades should be urban oriented. In the report of the National Water Commission, three of the seven themes have special relationship to urban water policy: (1) urban land-use planning and the use of urban flood-plain management is emphasized as an alternative to building dams and levees, (2) water resource planning and manage-ment can best be done at the local level, placing more responsibility on local units of government, and (3) national priorities are shifted from development to environmental improvement. As a basis for analyzing the Commission's findings and recommendations on planning, the author summarizes 5 of his own recommendations, the aim of which is to reorient water resource planning activities at the federal and state levels to support effective planning on the urban-metropolitan scale. Serious inadequacies in urban water data are not recognized in the report, it is deficient in emphasis on urban-oriented research, but in general, it reflects well the problems and issues of urban water management and makes some very useful and constructive recommendations. (See also W75-00981) (Diefendorf-North Carolina) W75-00983

THE CHANGING ROLE OF FEDERAL WATER DEVELOPMENT AGENCIES UNDER MULTI-OBJECTIVE PLANNING AND EVALUATION

Wisconsin Univ., Madison. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6E.

W75-00984

INSTITUTIONAL CHANGES FOR WATER DEVELOPMENT PROJECTS, New York State Coll. of Agriculture and Life

Sciences, Ithaca. For primary bibliographic entry see Field 6E. W75-00986

PRICING AND EFFICIENCY IN WATER RESOURCES MANAGEMENT, Johns Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 6C. W75-00987

THE CHANGING LAW ON SOCIAL VALUES IN

National Water Commission, Arlington, Va. For primary bibliographic entry see Field 6E.

WATER RESOURCES PLANNING—Field 6

Water Demand—Group 6D

OUTDOOR RECREATION AND WATER RESOURCES PLANNING, Simon Fraser Univ., Burnaby (British Columbia).

For primary bibliographic entry see Field 6D. W75-01003

WATER SUPPLY AND SEWERAGE SYSTEMS PLANNING PROGRAM,

Black River-St. Lawrence Regional Planning Board, Canton, N.Y. For primary bibliographic entry see Field 5D. W75-01004

LAND-USE PLANNING,

Connecticut Univ., Storrs. Coll. of Agriculture and Natural Resources. D. R. Miller, and H. F. Thomas.

Journal of Forestry, Vol 72, No 4, p 224-226, April 1974, 2 tab, 2 ref.

Descriptors: *Land use, *Planning, *Evaluation, Rural areas, Projects, *Connecticut, Water resources, Costs, Environment.

Identifiers: *Environmental review, Effectiveness, Foresters, Urban development, Environmental impact.

Foresters are being included in the interdisciplinary teams which evaluate environmental conditions for urban developments in rural areas. A pilot project is being conducted in eastern Connecticut in which local foresters play an important role as part of an interdisciplinary on-site inspection team. An examination is made of the team and its activities in order to aid other communities in their land-use planning efforts. A long-term planning approach is recommended which would recognize the need for a specific land use, identify land where resource conditions are most suited to the need, and then develop the land in a manner which preserves the unique and desirable features of the natural resources. Details of the mechanics of environ-mental review are elucidated. Team review procedures are outlined and the general sectors of the environment to be reviewed (water, land, biological, and air resources) are considered. An example of a summary report of an actual review is given. Finally, the cost and the effectiveness of reviews are discussed. The reviews have had major effects on municipal and closely regulated developments. They are most effective when conducted during the very preliminary planning and idea states of projects, before thousands of dollars have already been invested. (Bell-Cornell) W75-01005

COASTAL STABILISATION AT BARTON-ON-SEA, P. H. Phillips.

Civil Engineering (G.B.), No 816, p 50-53, July/August 1974. 3 fig, 7 ref.

*Social aspects, *Cost-benefit analysis, Engineering, Projects, Recreation, Real costs, Value, Properties, Surface waters, Groundwater, Equations, Systems analysis, Evaluation. Descriptors: *Coasts, *Protection, *Stabilization, Systems analysis, Evaluation.

Identifiers: Cliff recession, Environmental im-

pact, Economic analysis.

Current coastal protection policy in England may be producing schemes which are socially, economically, and environmentally undesirable. A study which has used social cost-benefit analysis to evaluate the works at Barton-on-Sea, Hampshire is reported; environmental impact is considered and some important implications are reviewed. Site characteristics, particularly cliff recession, and recent protection measures are discussed. It is shown that a considerable social cost has been incurred by the works at Barton and that only superficially may one consider the scheme beneficial. The analysis accounts for opportunity costs, the valuation of property, and real prices. The study demonstrates a primary need for an overall review of coastal protection policy and its integration within the wider planning sphere. The outcome of such a review would hopefully be the implementation of a land-use zoning policy in areas subject to erosion. Based on the characteristic of geomorphological processes operating in these areas, such a policy would do much to minimize the social cost of coastal land utilization. (Bell-Cornell) W75-01006

STRIP-MINE REGULATION AND RECLAMA-

TION: AN ATTITUDE SURVEY,
Clarkson Coll. of Technology, Potsdam, N.Y.
Dept. of Economics.
N. N. Reddy, and C. J. Buehler.

Arizona Review, Vol 23, No 3, p 1-4, March, 1974. 2 tab.

Descriptors: *Regulation. *Attitudes. Seaving mental control, "Land reclamation, "Strip-mines, Costs, Land Conservation, Land use, Sampling, Surveys, New York, Pennsylvania, Soil conservation, Water conservation, Water users, West Virginia, Mining, *Appalachian Mountain Region. Identifiers: Environmental protection, Open pit

A growing interest in the formulation of a national surface mine policy and a demand for alternative land uses led to a survey of public attitudes. Stratified random sampling was conducted in two urban counties and two rural counties in West Virginia, Pennsylvania, and New York. Three questions were posed: (1) are people aware of the environmental consequences of strip-mining, 92) do they favor a ban on strip-mining or prefer enactment and enforcement of a stringent recla-mation law, (3) if they support reclamation, who should pay for such work. Responses, obtained in similar proportions from strip-mine affected and non-strip-mine affected areas revealed: (1) the public considers permanent damage cause by strip-mining to be a serious national problem. (2) Americans do no favor current legislative proposals totally banning strip-mining, though younger respondents were more likely to prefer such a ban. (3) Strip-mining coupled with extensive reclamation was favored, and it was recognized that the cost of such reclamation must be borne by someone. Spreading of these costs was favored--some paid by state or federal government by additional direct taxes, some paid by industry, and some by the consumer. Of special interest was this indication of consumer willingness to share the cost for environmental protection. (Gloyd-Arizona) W75-01028

FISH HEALTH: A NATIONWIDE SURVEY OF PROBLEMS AND NEEDS,

Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research. For primary bibliographic entry see Field 5G. W75-01067

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

TESTIMONY OF MEMBERS OF CONGRESS AND OTHER INDIVIDUALS AND ORGANIZATIONS ON PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS, 1975. Committee on Appropriations (U.S. House). For primary bibliographic entry see Field 6E. W75-00727

PRICING AND EFFICIENCY IN WATER RESOURCES MANAGEMENT, Johns Hopkins Univ., Baltimore, Md.

In: National Water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 67-74, July, 1974.

Descriptors: *Pricing, *Efficiences, *National Water Commission, *Investment, *Cost sharing, Water resources, Water utilization, Expenditures, Productivity, Marginal costs, Public utilities, Demand, Social values, Municipal water, Navigation,

Identifiers: *Evaluation-reimbursement dichotomy, Subsidization, Congestion.

In an earlier study, the author suggests that users or beneficiaries, rather than continuing to receive generous subsidies in the form of free or nominally priced services from federal investment in water resource projects, should pay an effective price for services received. This study has been identified as the source of a recommendation by the National Water Commission. The theoretical framework is that the informational value of price permits the consumer to allocate expenditures and informs the producers how much to produce. When a good is underpriced, that is, price is less when a good is underpreced, that is, price is less than marginal cost, consumer demand can only be satisfied by creating a public utility. As users typically don't pay full cost, public service is subsidized. This problem, called the 'evaluation-reimbursement' dichotomy often prevails in the area of water resource investment. When zero or nominal price is charged, the result is an excessive quantity of the service being demanded. If the additional quantity is produced, there is net loss to society; if it is not produced, there is congestion which reduces the value of the service to all users. Such separation of pricing from public investment decisions in water resources encourages inefficient and inequitable use of the resource. Pricing arrangements in municipal water, sewage treatment, navigation, and irrigation are discussed with respect to the National Water Commission's policy recommendation of cost-sharing by local beneficiaries. It also seems feasible to impose effective pricing in outdoor recreation, flood damage abatement, shoreline protection, and hydroelectric power generation. However, regulation would be more difficult in these areas due to institutional and practical problems as well as nolitical realities. (See also W75-00981) political realities. (See (Diefendorf-North Carolina) W75-00987

ARIZONA AGRICULTURAL STATISTICS, Arizona Crop and Livestock Reporting Service,

Phoenix. For primary bibliographic entry see Field 3F. W75-01029

6D. Water Demand

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE-SUMMARY OF NINTH MEETING, MAY 21-23, 1974, SIOUX FALLS, SOUTH DAKOTA. Geological Survey, Reston, Va. Office of Water Data Coordination.
For primary bibliographic entry see Field 7A.

W75-00626

FORECASTING WATER DEMAND IN WYOM-ING WITH THE MAIN II SYSTEM,

Wyoming Univ., Laramie. Water Resources Research Inst.

V. E. Smith, and D. A. Quan. Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-237 068, \$8.50 in paper copy, \$2.25 in microfiche. Comple-tion Report, June 1974, Water Resources Series No 45. 251 p, 19 tab, 28 ref, 3 append. OWRT B-009-WYO(2). 14-31-001-3949.

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

Descriptors: *Municipal water, Computer models, *Forecasting, *Water demand, *Wyoming, *Computer programs, Cities, Optimal development plans, Programming languages, Model studies, Projections. Identifiers: *Main II water forecasting system.

The applicability was tested of the MAIN II (Municipal and Industrial Needs) Water Forecasting System to five Wyoming communities: Cheyenne, Casper, Glenrock, Rock Springs and Green River which are fairly representative of western communities. Errors found in the MAIN II program were corrected, and the program was modified. Certain kinds of data were difficult to obtain for the five communities. Using a base year, forecasts were made and compared with actual water demands. Three optional MAIN II projection methods (internal growth model, historical extrapolation of data and external projection) were tested. The results showed the latter two methods to be fairly reliable. The internal growth models were not representative of Wyoming cities due to the atypical growth patterns of Wyoming communities. W75-00700

FUTURE OF GROUNDWATER RESOURCES IN DUPAGE COUNTY,
Illinois State Water Survey, Warrenville. Hydrology Section. For primary bibliographic entry see Field 2F. W75-00748

CURRENT TRENDS IN WISCONSIN'S WATER

LAW, Wisconsin Univ., Madison. School of Law For primary bibliographic entry see Field 6E. W75-00798

CURRENT DEVELOPMENTS IN WATER LAW, Clyde and Mercham, Salt Lake City, Utah. For primary bibliographic entry see Field 6E. W75-00799

CONDEMNATION OF WATER RIGHTS FOR PREFERRED USES.-A REPLACEMENT FOR PRIOR APPROPRIATION,

Willamette Univ., Salem, Oreg. Coll. of Law. For primary bibliographic entry see Field 6E.

APPLICATION OF THE DOCTRINE OF INTER-VENING PUBLIC USE IN WATER LITIGA-TION, For primary bibliographic entry see Field 6E. W75-00926

PLEASURE BOATING IN A FEDERAL UNION, Buffalo Univ., N.Y. School of Law. For primary bibliographic entry see Field 6E.

LAND AND WATER POLLUTION FROM RECREATIONAL USE. National Industrial Pollution Control Council, Washington, D.C. For primary bibliographic entry see Field 5B. W75-00954

THE CHANGING ROLE OF FEDERAL WATER DEVELOPMENT AGENCIES UNDER MULTI-OBJECTIVE PLANNING AND EVALUATION Wisconsin Univ., Madison. Dept. of Agricultural

Economics. For primary bibliographic entry see Field 6E. W75-00984

CONCEPTUAL ASPECTS OF WATER REUSE. Netherlands Waterworks, Rijswijk. Testing and Research Inst.

For primary bibliographic entry see Field 5D.

OUTDOOR RECREATION AND WATER RESOURCES PLANNING, Simon Fraser Univ., Burnaby (British Columbia).

J. L. Knetsch.

Available from the American Geophysical Union, Washington, D.C. 20036 for \$3.50. Water Resources Monograph 3, American Geophysical Union, Washington, D.C., 1974. 121 p, 13 fig, 4 tab, 15 equ, 30 ref. OWRT C-2129(3367)(3).

Descriptors: *Water resources development, *Recreation demand, *Planning, *Analytical techniques, *Estimating, *Economic efficiency, Water utilization, Methodology, Value, Benefits, Environment, Projects, Human population, Lakes, Reservoirs, Costs, Equations.

Increases in population, income and leisure time have motivated a substantial growth in outdoor recreational activities, leading to the increased importance of recreational issues in the planning and management of water resource systems. A growing interest in land use planning also has contributed to this rise in importance of these issues. In recent years, there have been numerous advances in the development of techniques and procedures for quantitatively determining recreational demands and estimating recreation values. These advances, are summarized thereby facilitating the inclusion of recreation values in analyses of economic efficiency on both a local and a regional level. Emphasis is directed to some of the major principles that cut across a number of more specific problems, as well as to the presentation of examples illustrating how these principles might be implemented. Considered are: demand and outdoor recreation; estimating demands at specific sites; values and benefits; estimating recreational values; displaced facilities and benefit calcula-tions; and some limits and strategies. (Bell-Cor-W75-01003

6E. Water Law and Institutions

A NATIONAL WATER STRATEGY FOR ENGLAND AND WALES,

J. Ardill. Water and Sewage Works, Vol 121, No 5, p 58-60, 73, May, 1974.

Descriptors: *Management, *Water supply, Sewage disposal, *Water pollution control, Flood protection, Drainage, Fisheries, Planning, Reservoirs, Estuaries, Water storage, *Water districts. Identifiers: *United Kingdom(Regional Water Authorities) Authorities).

Water resources management problems in England and Wales result not from an intrinsic shortage of water but from an uneven distribution of available water over time and place. The Water Resources Board, now over ten years old, acts in conjunction with a more recently established National Water Council and Regional Water Authorities. These managerial bodies deal with the fields of river management, water supply, sewerage and sewage disposal, pollution control, flood protection, land drainage, fisheries, and recreational use of water space. The creation of the RWAs will integrate financial and administrative problems. Recommended plans include building of new reservoirs, expanding existing reservoirs, and constructing new aqueducts between rivers. The most novel development in the program is estuary storage, which will involve major civil engineering works in the Dee, which separates North Wales from northwest England. The various water storage plans are to be undertaken one at a time. (Prague-FIRL) W75-00600

8 (1974), 1590 p.

A NEW LOOK FOR WATER MANAGEMENT IN SCOTLAND, For primary bibliographic entry see Field 5G. W75-00716

SOUND STANDARDS FOR ENVIRONMENTAL IMPROVEMENT, Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-00725

TESTIMONY OF MEMBERS OF CONGRESS AND OTHER INDIVIDUALS AND ORGANIZA-TIONS ON PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENER-GY COMMISSION APPROPRIATIONS, 1975. Committee on Appropriations (U.S. House). Hearings--Subcomm on Public Works, US House of Representatives, 93d Cong, 2d Sess, parts 7 and

Descriptors: *Federal government, *Water management(Applied), *Legislation, *Political aspects, Harbors, Rivers, Dams, Economics, Administrative agencies, Coordination, Legal aspects, Planning, Water resources development, Costs, Operating costs, Decision making, Adoption of practices, State governments, Water pol-icy, Natural resources, Construction costs, Canal construction, Civil engineering, Environmental ef-fects, Resources allocation, Conservation. Identifiers: *Congressional hearings.

The record of hearings represents a compendium of statements, testimony, and studies on appropriations for harbors and water management projects throughout the nation for fiscal year 1975. Included is a report on a statewide program for conservation and development of water resources in Texas, submitted as a model for other state and federal agencies. Testimony is presented on in-dividual management and construction projects in the various states requiring congressional ap-propriations. Representatives of governmental agencies, environmental action groups, and private individuals supporting or opposing funding to the various harbor, river or water power projects present a broad spectrum of political, scientific and economic interests and data, seeking to influence legislation at the national policy level as well as at the individual project level. (Salley-Florida) W75-00727

LEGAL COMPILATION-STATUTES AND LEGISLATIVE HISTORY, EXECUTIVE ORDERS, REGULATIONS, GUIDELINES AND REPORTS (PESTICIDES) VOL. 1, II, III. Environmental Protection Agency, Washington, D.C. Office of Legislation. D.C. Office of Legislation.
For primary bibliographic entry see Field 5G.
W75-00728

OPEN BEACHES (BILLS TO AMEND THE ACT OF AUGUST 3, 1968, RELATING TO THE NA-TION'S ESTUARIES AND THEIR NATURAL RESOURCES, TO ESTABLISH A NATIONAL POLICY WITH RESPECT TO THE NATION'S BEACH RESOURCES).

Committee on Merchant Marine and Fisheries (U.S. House).

Hearings-Subcomm on Fisheries and Wildlife Conservation and the Environment, US House of Representatives, 93d Cong, 1st Sess, October 25, 26, 1973. 219 p.

Descriptors: *Seashores, *Beaches, Legislation, Comprehensive planning, *Federal government, State governments, Management, Public access, Coordination, Legal aspects, Decision making,

Government finance, Inter-agency cooperation, Water law, Water policy, Water resources, Planning, Riparian rights, Competing uses, Ad-jacent landowners, Scenic easements, Water resources development, Coasts.

Identifiers: *Coastal waters, *Coastal zone management, *Congressional hearings.

The hearing deals with two proposed amendments which would create a national policy toward the maintenance of public access to beaches. The amendments, among other things, would authorize the federal government to supply seventy-five percent of the needed funds for acquisition of beach lands and would vest in the states primary administrative responsibility for their control and maintenance. Six governmental agencies supplied reports on the amendments with their conclusions, and these are followed by numerous statements by individuals. The Council on Environmental Quality outlined its opposition to the amendments as undesirable in terms of affecting close cooperation between the federal government and coastal states on such an issue, an objection also voiced by the Department of the Interior. The Department of the Army voiced objections to the lack of clarity in delineating the rights of landowners vis-a-vis public acess and to the possible interference such legislation would pose to Army Corps of Engineers projects associated with beach areas. Neither the Departments of Transportation nor Justice supported the bill, and outlined numerous objections. The statements of witnesses contain further objections, but strong support for the bill is forwarded as well on the grounds that some clear national policy toward the natural resources represented by beaches must be outlined and made law. (Salley-Florida) W75-00729

THE NATIONAL ENVIRONMENTAL POLICY ACT AS A FULL DISCLOSURE LAW, Cornell Univ., Ithaca, N.Y. Cornell Energy Pro-

ject. J. A. Best.

Available from the National Technical Informa-tion Service, U.S. Dept. of Commerce as PB-227 809, \$3.75 in paper copy, \$2.25 in microfiche. December 1972. 22 p, 55 ref.

Descriptors: *Legislation, *Federal jurisdiction, *Administrative agencies, *Judicial decisions, *Legal aspects, Regulation, Standards, Federal government, Political aspects, Natural resources, Pollution control, Project purposes, Environmental effects, Environmental control, Permits.
Identifiers: *National Environmental Policy Act.

At its inception, the National Environmental Policy Act (NEPA) was mistakenly viewed by federal agencies as nothing more than bureaucratic rhetoric. As NEPA began to be used the agencies began to realize the actual teeth of enforcement it possessed, as well as the requirement that business would no longer go on as usual. NEPA requires production of a written record containing specific detailed information. Under section 102(2) (C) all agencies must include in every report for legislation and other federal action the environmental impact of the proposed action, any adverse effects hich cannot be avoided if the proposal is implemented, alternatives to the proposed action and any irreversible and irretrievable commitments of resources which would be involved in implementa-tion of the proposal. While the courts will not overturn a substantive agency decision on the merits, the courts' strict interpretation of the procedural requirements of NEPA should and have promoted substantial reforms in the federal agency decision-making process. Analysis of court rulings shows that NEPA procedural duties are mandatory, there is no exemption or immunity for permanent agencies, and a major action is in essence, any action. (Silber-Florida) W75-00730

ENVIRONMENTAL EVALUATION, BOISE DIS-TRICT, BUREAU OF LAND MANAGEMENT, Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5G. W75-00731

IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF PEARL HARBOR AND ITS TRIBUTARIES IN THE STATE OF HAWAII.

Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-00734

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR ARMY MILITARY PROGRAMS, Army Construction Engineering Research Lab., Champaign, Ill. For primary bibliographic entry see Field 6G. W75-00735

FEDERAL WATER POLLUTION CONTROL LEGISLATION: CURRENT PROPOSALS TO ACHIEVE MORE EFFECTIVE ENFORCE-

For primary bibliographic entry see Field 5G. W75-00736

LEGAL ASPECTS OF THE ENVIRONMENT. Best, Best and Krieger, Riverside, Calif. For primary bibliographic entry see Field 6G. W75-00737

THE CHALLENGE OF THE ENVIRONMENT: A PRIMER ON EPA'S STATUTORY AUTHORITY. Environmental Protection Agency, Washington, D.C.

Available from National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va. 22161, as PB-228 025, \$3.75 in paper copy, \$2.25 in microfiche. July 1972. 35 p.

Descriptors: *Administrative *Legislation, *Legal aspects, *Federal govern-ment, *Environmental control, Regulation, Coordination, Standards, Effluents, Oil spills, Natural resources, Planning, Water pollution, Water pollution sources, Pollution control, Pollution abatement, Navigable waters, Water policy, Waste disposal, Pesticides, Radiation, Air, International law, Interstate compacts, Enforcement, Water quality, Water quality standards. Identifiers: *Effluent limitations.

This booklet is intended to give an idea of the scope of the Environmental Protection Agency's (EPA) duties and responsibilities by providing a brief summary of its legal authority. The EPA's most complex problem centers around striking a balance between the protection of the natural environment and securing the benefits of economic and technological progress. The National Environ-mental Policy Act of 1969 (NEPA) is the focal point of the agency's function, in that it requires a systematic consideration of the environmental impact of all major federal activities. Federal agencies must now file environmental impact statements (EIS) for all proposed actions, including discussions of all adverse environmental effects which cannot be avoided and program alternatives, to be reviewed by EPA. The Agency's scope covers air, water, solid waste, pesticides, radiation, noise and international matters. Their authority in dealing with water problems is supplemented by the Federal Water Pollution Control Act (FWPCA), the Rivers and Harbors Act and others. Establishing water quality standards and others. Establishing water quality standards and prosecution of their violations, as well as coordination of federal-state programs and interstate compacts fall within EPAs mandate. (Deckert-Florida) W75-00738

DEVELOPMENTS IN WATER UTILITY LAW. American Bar Association, Washington, D.C., Subcommittee on Water Resources. For primary bibliographic entry see Field 5G. W75-00739

TOWARD AN AGREEMENT ON THE EXTER-NAL DELIMITATION OF THE TERRITORIAL SEA, T. R. Suher.

In: Sea Grant Publication UNC-SG-73-01, p 59-67, March 1973. 9 p, 28 ref.

Descriptors: *Law of the sea, *International law, *Treaties, *International waters, *Governmental interrelations, Legal aspects, Water law, Water policy, Oceans, Foreign trade, Foreign waters, Marine fisheries, Water rights, Water resources development, Governments, Regulations, Jurisdiction, Negotiations, Continental shelf, Continental margin, Exploitation.
Identifiers: Territorial seas(Jurisdiction), *Seabed

mining, International agreements, *Territorial

A paramount concern of the United Nations Con-ference on the Law of the Sea, to convene in 1973, will be an agreement on the breadth of the territorial sea. Many variables are involved in the dispute as to how wide the territorial sea should be. The primary sources of disagreement are economic concerns including fisheries control, natural resources, preservation, freedom of transportation, and security concerns including naval mobility, coastal protection, and neutrality. Presented are an analysis and evaluation of these factors, the respective views of various nations concerning them, possible methods of resolving the conflicting attitudes, and the prospects for a lasting accord. Major barriers to any agreement toward delimitation are the ascendant nationalism of the developing nations, advocating a widening of the territorial sea, and the opposition of Russia and some of the underdeveloped nations to the use of contiguous zones. Nonetheless, a 12-mile limit with right of free passage through international straits might be created, provided the developing nations can be persuaded that an international agreement would promote their nationalistic goals. (Deckert-Florida) W75-00740

LEGAL ACTION TO CURB POLLUTION OF THE SEA.

For primary bibliographic entry see Field 5G.

CURRENT TRENDS IN WISCONSIN'S WATER

Wisconsin Univ., Madison. School of Law. J. H. Beuscher.

Wisconsin Bar Bulletin, Vol 40, p 19-28, April 1967, 10 p.

Descriptors: *Wisconsin, *Water law, *Legislation, *Judicial decisions, *Adjudication *Wisconsin. procedure, Water pollution, Water quality control, Water treatment, Navigable waters, Drainage, Construction, Streams, Rivers, Lakes, Riparian rights, Water use, Surface water, Drainage prac-tices, Water resources development, Water con-servation, Land management, Water manage-ment(Applied), Water allocation(Policy), Water

policy.
Identifiers: *Water right(Non-riparians).

Current trends in Wisconsin's water law is divided into three parts: (1) the law of draining diffused surface water, (2) the law of groundwater and (3) riparian law which applies to streams, lakes and ponds. Wisconsin courts have held that both the upper and lower landowners may challenge the right of any party to drain surface water by grad-ing, filling or construction. The challenging party will prevail unless the other party does so to im-

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

prove his land for economic reasons. With reference to groundwater, the state courts have held that the landowner has absolute use of groundwater. A possible shift to the application of the reasonable use doctrine is in the offing. The courts continue to play a principal role in declaring co-sharing riparian rights in watercourses and in deliniating so-called public rights in navigable water on behalf of non-riparians. Both the legislature and the Public Service Commission have also intervened. A case dealing with filling in navigable streams is described. The major state development in water law in recent years was the legislature's enactment of the Water Resources Act of 1966. The effects of the legislation in uniting water pollution and control agencies, stream and shoreline protection, and septic tank controls are discussed. (Sperling-Florida)

CURRENT DEVELOPMENTS IN WATER LAW, Clyde and Mercham, Salt Lake City, Utah.

Northwestern University Law Review, Vol 53, No 6, p 725-748, January-February, 1959. 24 p, 70 ref.

Descriptors: *Riparian rights, *Water rights, *Legal aspects, *Governmental interrelations, *Federal-state water law conflicts, Jurisdiction, Compensation, Economics, Legislation, State governments, Water law, Water utilization, Prescriptive rights, Preferences, Public use, Federal government, Adoption of practices, Water policy, Federal jurisdiction, State jurisdiction. Identifiers: *State policy, Water rights(Non-riparians).

The doctrine of prior appropriation as it applied in the early development of the Western United States is discussed. By 1849, a firm system of law had been formulated by judicial decision and con-sisted of the principles that water in its natural course is the property of the public, that a vested right to use water may be acquired by appropriation and application to beneficial use, that the person first in time is first in right, and that beneficial use is the basis and the limit of the right. After 1862, Congress provided ways by which title could be acquired to federal lands. In 1877, Congress established the right of each state to adopt its own system of water law to govern appropriation of nonavigable waters. The federal government as proprietor has, however, placed substantial limitations on the concept of state control. One of the main limitations is the power to regulate commerce and to control navigable waters. Indian water rights are a federally controlled body of law. This outlook has been affirmed by the Supreme Court in the Pelt decision. Where the federal government has permitted acquisition of private rights in accordance with state laws, the rights are protected. As to the federal-state interplay, there must be some dual control. The matter should be resolved as policy and not power. (Sperling-Florida)

CONDEMNATION OF WATER RIGHTS FOR PREFERRED USES...A REPLACEMENT FOR PRIOR APPROPRIATION,

Willamette Univ., Salem, Oreg. Coll. of Law. A. D. Gross.

Willamette Law Journal, Vol 3, p 263-283, 1965. 21 p, 133 ref.

Descriptors: *Condemnation, *Water rights, *Legal aspects, *Economic impact, *Riparian rights, Eminent domain, Compensation, Value, Economics, Judicial decisions, State governments, Legislation, Municipalities, Water law, Water utilization, Prescriptive rights, Appropriation, Preferences, Jurisdiction, State jurisdiction, Water policy, Adoption of practices, Water allocation(Policy). Identifiers: *State policy.

The custom of granting water rights to the prior appropriator became the law of the West. As the West developed, it became natural that the peculiar circumstances of each state demanded preference be granted particular uses of water irrespective of the time factor. The law of preference was influenced by the addition of both a reasonable use and a beneficial use limitation upon riparian rights. Almost all western states by constitution or statute grant preferences to specified uses of water in time of scarcity. Preferred users effectuate their preferences through considerations of state agencies, the granting of conditional appropriation rights, and as the basis for exercising eminent domain. Con-demnation of water rights as the need arises is less convenient than the preventative cures of conditional water rights and the setting aside of water for future uses. The power of condemnation has been granted to quasi-public organizations as well as municipalities. The definition of public use is an expanding conception underlying condemnation. This definitional evolution has been on a case-bycase basis. Courts now weigh competing factors to determine the necessity of condemnation. (Sperling-Florida) W75-00800

RECLAMATION OF WATER RIGHTS,

Wyoming Univ., Laramie. Coll. of Law. F. J. Trelease.

Rocky Mountain Law Review Vol 32, p 464-501, 1960. 188 ref.

Descriptors: "Water rights, "Reclamation, "Judicial decisions, "Legislation, Regulation enforcement, Land reclamation, Water sources, Water supply, Return flow, Administrative agencies, Water law, Water demand, Water resources, Development, Water quality controls, Water management(Applied), Water allocation(Policy), Water policy appropriation.

When the United States, by the passage of the Reclamation Act, entered the field of building large scale irrigation projects, its new policy of water development incorporated the much older policy of recognizing the law of the states and territories as a source of water rights. The water right for a Reclamation project is an appropriation depending for its existence on the law of the state in which it is located. The law pertaining to seepage or return flows is discussed. The doctrine of prior appropriation was created on the basis of individual water needs for individual farms and mining enterprises. Abuses arose followed by corrective legislation and court decisions. The Act provides that the Secretary of the Interior must proceed in conformity with state laws relating to control, appropriation, use, or distribution of water used in irrigation, in carrying out the provisions of the Act. (Sperling-Florida)

LOG RAFTING AND THE RIPARIAN PROPRIETOR,
J. W. Christensen.

Willamette Law Journal, Vol 2, p 345-351, 1962. 7 p, 38 ref.

Descriptors: *Riparian rights, *Navigable waters, *Legal aspects, Water law, Water rights, Banks, Civil law, Competing uses, Legislation, Recreation, Water resources, Ownership, Common law, Judicial decisions, Water resources development, Rivers, Adoption of practices, Access routes, State governments.

Identifiers: *Water rights(Non-riparians), *State policy.

The relationships between the riparian owner and public access to navigable water are discussed. At common law only the riparian property owner, who owned land adjoining the water, had unlimited access to it. Other than the limited access

provided by public bridges, non-riparian owners would have to trespass on riparian estates to reach the stream. The public did have a right to use navigable waters. Because the United States courts inherited the common law, they held that on navigable rivers the riparian owners did not take to the middle of the river, but rather the state is the owner of river bottom, and the public has an easement to use the river. Tests have been devised to determine navigability. The public easement to use the rivers and streams as highways does not confer any right to the use of the banks. Litigation applying the floating log test of stream navigability is not as prevalent today. The clash of interests between the absolute public right to use the navigable stream and the absolute right of the property owner to enjoy his land is not resolved. (Sperling-Florida) W75-00802

OFFSHORE OIL DRILLING: A COMPARISON OF STATE LAWS, For primary bibliographic entry see Field 5G. W75-00803

APPLICATION OF THE DOCTRINE OF INTER-VENING PUBLIC USE IN WATER LITIGA-TION,

Stanford Law Review, Vol 13, p 180-184, December 1960. 30 ref.

Descriptors: *Water rights, *Legal aspects, *Prescriptive rights, *Riparian rights, *Appropriation, Water law, Judicial decisions, *California, Relative rights, Competing uses, Equitable apportionment, Equity, Overlying proprietor, Water utilization, Public rights, Public benefits, Water policy, Adoption of practices. Identifiers: *Injunctive relief.

Application of the doctrine of intervening public use in water litigation is examined. The defendant cities had been taking increasing amounts of water for a public use from the river system. Plaintiff, a downstream water district representing overlying water rights, sued to enjoin the cities from diverting water in excess of their prescriptive rights. The court held that the public use could not be invoked, but under the equitable principles embodied in the public use doctrine, the defendants are relieved from the limitations of their prescriptive rights for three years. In California, water rights are classified as riparian and overlying rights are based on ownership of land contiguous to a surface or underground water supply. Appropriate and prescriptive rights exist without contiguity of the land to water. They are acquired by using water for a beneficial purpose. The court might have allowed defendant to take water in excess of its prescriptive rights under the doctrine of intervening public use. This doctrine may be invoked on a theory of estoppel or public policy. The court did not discuss what effect allowing the intervention would have on the total amount of water put to the highest beneficial use. (Sperling-Florida)

BOUNDARIES--WATER--EASEMENTS--BOUNDARY CALL FOR EDGE OF LAKE DOES NOT EXTEND OWNERSHIP TO LAKE BED--IMPLIED EASEMENT GIVEN EXTREMELY BROAD SCOPE,

E. S. Christian, Jr. Texas Law Review, Vol 38, p 492-496, 1960. 26 ref.

Descriptors: *Easements, *Lakes, *Rivers, *Legal aspects, Judicial decisions, Meanders, Lake shores, Lake beds, Ownership of beds, Water law, Streams, Riparian rights, Banks, Water rights, Competing uses, Contours, Water policy, Land tenure, Conservation, Water resources development, Adjudication procedure, Texas.

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Identifiers: *Water rights(Non-riparians), *State policy.

The case of Ulbricht v. Friedsam dealing with boundaries, waters and easements is examined. The petitioners are grantees of a tract abutting a lake. The respondent's predecessor in title had granted an easement, now held by the Lower Colorado River Authority, to flood and inundate the land up to a contour line. Ordinarily water does not reach the contour line. Ordinarily water does not reach the contour line. The petitioners seek title to the submerged land between the contour line and the lake center. Failure to acquire this area would leave the respondent owning a strip of land between the contour line and water's edge thus preventing petitioners' use of the land as lake frontage. In the alternative, petitioners seek an easement to use the land below the line as lake frontage. The general rule of law is that a grant of peoperty bounded by a river or stream extends to the center of the bed. Most jurisdictions apply the same rule to lakes as to rivers. Although the petitioners were not awarded title to the land below the line, they did by virtue of the implied easement gain substantially the benefits of ownership. The court employed the rule of an implied easement based upon reasonable necessity. The court's holding an implied easement is questioned and fair lake division is suggested as a better answer. (Sperling-Florida)

TOXIC POLLUTANTS HEARINGS REGS

For primary bibliographic entry see Field 5G. W75-00928

PREVENTION OF POLLUTION OF MICHIGAN WATER RESOURCES,
Detroit Dept. of Health, Mich.

Detroit Dept. of Health, Mich. For primary bibliographic entry see Field 5G. W75-00932

PROPERTY--OWNERSHIP OF LAND UNDER NON-NAVIGABLE LAKE--RIGHT TO ENCLOSE, L. J. M. Solis.

R. J. M. Solis. Tulane Law Review, Vol 34, p 641-647, 1960. 51 ref.

Descriptors: *Boundaries(Property), *Ownership of beds, *Legal aspects, *Judicial decisions, *Land tenure, Lakes, Stream bed, Navigation, River beds, Non-navigable waters, Riparian rights, United States, International law, Florida, State governments, Streamflow. Identifiers: *Navigability tests.

The Florida Supreme Court adopted what the court termed the civil law rule. They held that a land-locked, non-navigable lake may be used by all owners of property covered by the lake so long as that use does not unreasonably interfere with the rights of the other proprietors. If a lake is called public, the lake-bed belongs to the state and its water may be subject to common use. Some jurisdictions have established state ownership of all waters and water bottoms. Others have recognized private ownership of only certain classes of lakes. The Code of Chile vests the ownership, use and enjoyment of non-navigable lakes in the riparian owners. In Scotland private ownership of waters is recognized only in the absence of a constant flow. In the United States recognition of private ownership of waters is subject to the test of navigability, non-navigable waters being, as a general rule, subject to private ownership. (Sperling-Florida) W75-00933

PLEASURE BOATING IN A FEDERAL UNION, Buffalo Univ., N.Y. School of Law. G. G. Waite.

Buffalo Law Review, Vol 10, p 427-447, 1961. 21 p, 81 ref.

Descriptors: *Boating, *Jurisdiction, *State governments, *Federal government, *Governmental interrelations, Judicial decisions, Navigable waters, Interstate commerce, Regulation, Legal aspects, Bed ownership, Water law, Admiralty, Ships, Channels, Streams, Recreation, Recreation demand.

As more power boats are used on the public waterways and these boats are becoming ever faster, safety hazards arise which must be lessened. Since there is a need for controlling boat usage, both the interests of the federal and state governments must be considered. Although state governments traditionally are concerned with the safety of their residents and property, the interest of the federal government in the maintenance of order among recreational water activities is increasingly recognized. Recreational boating has been traditionally a public right controlled by state law. Today the federal government exercises considerable control through its power to regulate interstate commerce. Navigability often determines the relative impact of state and federal law. The federal test of naviga-bility in determining ownership of the beds of watercourses is whether the watercourse could be used for commerce. In the eastern United States, some watercourses may be used only by the owners of the banks while other must be shared by the riparian owners with the public. The test of navigability in this area has been left up to the individual states. Some states do, however, apply the federal navigability test used for bed title purposes. The federal test also is used to determine the waters to which federal admiralty jurisdiction ends. (Sperling-Florida) W75-00934

PRETREATMENT GUIDELINES RELEASED BY EPA.

For primary bibliographic entry see Field 5G. W75-00936

WATER QUALITY CRITERIA. For primary bibliographic entry see Field 5G. W75-00937

WATER QUALITY STANDARDS. For primary bibliographic entry see Field 5G. W75-00938

EPA NPDES PERMIT PROGRAM. For primary bibliographic entry see Field 5G. W75-00939

STATE PARTICIPATION IN NPDES. For primary bibliographic entry see Field 5G. W75-00940

WATER REGULATIONS--CRITERIA FOR STATE, LOCAL AND REGIONAL OIL REMOVAL CONTIGENCY PLANS. For primary bibliographic entry see Field 5G. W75-00941

WATER REGULATIONS--DISCHARGE OF OIL. For primary bibliographic entry see Field 5G. W75-00942

WATER REGULATIONS--MARINE SANITA-TION DEVICE STANDARDS. Pollution Control Guides, Vol 2, paragraph 9000-9004, p 9461-9462, 1973.

Descriptors: "Water pollution, "Water quality control, "Regulations, "Effluents, "Waste water treatment, Sewage, Sewage treatment, Navigable waters, Water law, Environmental sanitation, Regulation, Ships, Sewage disposal, "Water quality standards, Federal government, Administration, Adoption of practices.

Identifiers: Environmental policy, Administrative regulations.

Water quality standards regulating marine sanitation devices are presented. The standard adopted applies only to vessels on which a marine sanitation facility has been installed. Devices installed on vessels covered by the regulations shall be designed and operated to prevent discharge of sewage, treated or untreated, or of any waste derived from sewage, into the navigable waters of the United States. A state may apply to the Administrator of the Environmental Protection Agency for the issuance of a regulation completely prohibiting discharge from a vessel of any sewage into navigable waters of that state or specified portions of their waters. If the state's application and other available information do not indicate a need for complete prohibition of all discharges, the Administrator shall state the specific reasons for so denying the application. Analytical procedures for determining the composition and quality of effluents discharge are set forth. (Sperling-Florida) W75-00943

WATER REGULATIONS--TRANSPORTATION FOR DUMPING AND DUMPING OF MATERI-AL INTO OCEAN WATERS. For primary bibliographic entry see Field 5G. W75-00944

PROPOSED REGULATIONS--INTERSTATE WATERS OF STATE OF ALABAMA. For primary bibliographic entry see Field 5G. W75-00945

PROPOSED REGULATIONS--NAVIGABLE WATERS OF STATE OF WEST VIRGINIA. For primary bibliographic entry see Field 5G. W75-00946

PROPOSED REGULATIONS.-NAVIGABLE WATERS OF THE STATE OF NEW JERSEY. For primary bibliographic entry see Field 5G. W75-00947

PROPOSED REGULATIONS--NAVIGABLE WATERS OF THE STATE OF NEW YORK. For primary bibliographic entry see Field 5G. W75-00948

PROPOSED REGULATIONS--NAVIGABLE WATERS OF THE STATE OF OHIO. For primary bibliographic entry see Field 5G. W75-00949

PROPOSED REGULATIONS--THERMAL DISCHARGES. For primary bibliographic entry see Field 5G. W75-00950

PROPOSED REGULATIONS-WATER PROGRAM--PROPOSED TOXIC POLLUTANT EF-FLUENT STANDARDS. For primary bibliographic entry see Field 5G. W75-00951

U.S. V. MOBIL OIL CORP. (RIVERS AND HARBORS ACT VIOLATION). 464 F.2d 1124 (5th Cir. 1972).

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Texas, Navigable waters, Oily water.

The defendant corporation was charged with violating a provision of the Rivers and Harbors Appropriation Act of 1899, 33 U.S.C. subsections 407, 411 which banned the discharge of refuse into

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a navigable waterway. A mechanical malfunction at one of the defendant's plants resulted in discharge of approximately 150 barrels of oil into a creek. Pursuant to the Federal Water Pollution Control Act, 33 U.S.C. section 1161 (b) (4), the defendant, through an employee, notified the Coast Guard. Following investigation the government brought charges against the defendant. The defendant argued that as owner-operator of the plant it was a 'person in charge' under section 1161 of the Water Pollution Control Act and thus was entitled to immunity from prosecution. The government contended that the defendant was not within the class of persons to whom immunity extended. Reversing the lower court conviction, the Fifth Circuit Court of Appeal ruled that a corporation which owned and operated the plant where the discharge occurred as a 'person in charge' under the Water Pollution Control Act and was therefore entitled to immunity from prosecution where such prosecution is based upon information supplied by the corporation. (Deckert-Florida)

BURGESS V. M/V TAMANO (PROCEEDINGS ON MOTION TO DISMISS SUITS SEEKING DAMAGES AS A RESULT OF OIL SPILLAGE). 370 F. Supp. 247 (S.D. Maine 1973).

Descriptors: *Maine, *Judicial decisions, *Navigable waters, *Oil spillage, *Oil pollution, Inland waterways.

On July 22, 1972 the oil tanker M/V Tamano struck Soldier's Ledge in Casco Bay, Maine. As a result 100,000 gallons of Bunker C oil were discharged into the bay. Plaintiffs can be divided into two groups: those who are fishermen and clam diggers, and those who are businessmen who lost business. The fishermen and clam diggers' claim is predicted on destruction of the fishery resource, which is the basis of their livelihood. The businessmen's claim is predicted on a loss of business because Casco Bay lost much of its aesthetic appeal after the oil spill. The defendants include the Tamano, her owners, her captain, her pilot, the local pilot's association, her charterer, Texaco, Inc., the State of Maine and the United States. The defendants moved to dismiss both groups of plaintiffs for failure to state a claim upon which relief can be based. The Federal District Court denied the motion as to the plantiff fishermen and clam diggers. The court held that fishermen and clam diggers had been injured specifically beyond the general public injury. The court sustained the motion as to the plaintiff businessmen because their injury was not distinct from the general public. (Barnes-Florida) W75-00953

ENVIRONMENTAL DEFENSE FUND, INC. V. ARMSTRONG (INJUNCTION ACTION AGAINST CONSTRUCTION OF A DAM). 487 F.2d 814-822 (9th Cir. 1973).

Descriptors: *California, *Judicial decisions, *Dams, Dam design, Flood control, Diversion tunnels, Administrative agencies.

James, Asia testin, Toda testino, Diversion tunnels, Administrative agencies. Identifiers: *Environmental Impact Statements, *Injunctive relief, *National Environmental Policy Act.

Plaintiff environmental protection group sought injunctive and other relief against the defendant federal agencies in their building of the New Melones Dam. An Environmental Impact Statement (EIS) was filed under the provisions of the National Environmental Policy Act of 1969 (NEPA) because the New Melones Dam across the Stanislaus River in California constituted a 'major Federal action' which would significantly affect the quality of the human environment. The dam was authorized by legislation as a multi-purpose project with benefits including flood control, power generation and irrigation. This action concerns the main construction and completion of that

project. Plaintiff contended that the original EIS did not discuss the uses of the water produced as 'conservation yield' of the project. The trial court ordered a supplemental EIS submitted. Plaintiff alleged that the revised EIS did not assign priorities of need for the conservation yield or demonstrate alternatives to the project. Trial and appellate courts, however, found that the revised EIS complied with the NEPA requirements. The court decided to retain jurisdiction throughout the project's development in order to be able to protect the presently unforeseen interests of all parties concerned. Relief denied to plantiffs. (Dillingham-Florida)

ENVIRONMENTAL POLICY ACT. N.C. Gen. Stat., secs. 113A-1 thru 113A-11 (1971).

Descriptors: *Legislation, *North Carolina, Administrative agencies.

North Carolina statutory provisions define the purposes of the article and declare generally the environmental policy of the state. Specifically the act mandates that all policies, regulations, and public laws of the state shall be interpreted in acordance with that policy. The conduct of state agencies and major development projects with respect to preparing environmental impact studies upon all proposals for legislation and action involving public moneys are regulated. Development planning projects and procedures function through the auspices of institutions of higher learning throughout the state. Administrative agencies shall bring their authority into conformity with the intent of the act. Terms employed in the statutory language are defined. (Proctor-Florida) W75-00956

GOVERNMENTAL REORGANIZATION FOR NATURAL RESOURCES PROTECTION. Journal Water Pollution Control Federation, Vol 45, No 8, p 1639-1640, Aug 1973.

Descriptors: *Administrative agencies, *Federal government, *Regulation, *Water allocation(Policy), *Resources allocation, Institutions, Water law, Legislation, Water quality, Environmental effects, Government, Research, Data collection, Energy, Land resources, Water resources, Natural resources, Water policy, Water management(Applied), Land management, Intergovernmental relations, Adoption of practices, Water quality control, Water resources development. Identifiers: *Energy crisis, *Administrative regulations.

Federal governmental agency reorganization to optimize natural resources protection is discussed. Various presidential proposals to deal with energy related concerns have been considered. Among them are proposals to combat present energy con-cerns; to establish a Department of Energy; to establish the Energy Research and Development Administration; and to retain the organization of the Atomic Energy Commission to license and regulate environmental safety. By executive order, the President created the Energy Policy Office to help guide the development of the administration's energy policies. The Department of Energy and Natural Resources will contribute to combatting the energy crisis by balancing the utilization and conservation of the nation's energy administration, land and recreation resources administration, water resources administration, oceanic, atmospheric, and earth sciences administration, and Indian and territorial affairs will be coordinated under the Department of Energy and Natural Resources. Also discussed is the Energy Research and Development Administration which will coordinate and direct research and development programs on all forms of energy. (Sperling-Florida)

EPA BEGINS COMPLIANCE WITH 1972 AMENDMENTS.

For primary bibliographic entry see Field 5G. W75-00958

NORTH CAROLINA'S WATER POLLUTION CONTROL PROGRAM, PART I: AN OVER-VIEW OF THE PROBLEM, For primary bibliographic entry see Field 5G. W75-00960

COMMONWEALTH V. BARNES AND TUCKER CO. (MINE WATER DISCHARGE PERMIT SYSTEM). 303 A.2d 544 (Pa. Cmmwith. 1973).

Descriptors: "Pennsylvania, "Acid mine water, "Waste water treatment, "Water quality standards, "Judicial decisions, Mine drainage, Abatement, Abandoned mines, Proprietary power, Discharge(Water), Waste water(Pollution), Water pollution sources, Acid streams, Environmental effects, Legal aspects, Water pollution, Pollution abatement, Adoption of practices, Water purification, Coal mine wastes.

Identifiers: Post mining discharge, Nuisance(Legal aspects), Effluent limitations, Injunctive relief.

Issues in this case involved the interpretation of the Pennsylvania Clean Streams Law (CSL) and amendments. Defendant company owned nonoperational coal mines from which acid mine wastes were escaping and polluting the streams of plantiff state. Plaintiff, Pennsylvania, brought action seeking a mandatory injunction requiring defendant to treat those discharges which did not meet minimum water quality standards. Plaintiff alleged that defendant, as holder of a permit under the 1965 Amendments to the CSL, assumed responsibility for acid water discharge after cessation of mining operations. Plaintiff argued that defendant was obliged to abate the deleterious effects of the discharges to meet state standards. Plaintiff argued that defendant's acid discharges constituted a public nuisance under the CSL and under the common law, and therefore defendant was obliged to abate the nuisance. Defendant denied all allegations. The court held for the defendant but allowed the preliminary injunction to stand under a decree nisi pending determination of money damages or filing of exceptions by either party. (Chennault-Florida)

NATIONAL WATER COMMISSION: A REVIEW OF SOME ISSUES, PROCEEDINGS OF A SEMINAR SERIES, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.

Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 283, \$4.75 in paper copy, \$2.25 in microfiche. Bullettn No 75, (VPI-WRCC-BULL T5), July 1974, 87 p, Peter M. Ashton, editor. OWRT A-999-VA(20).

Descriptors: *National Water Commission, *Reviews, *Water resources development, *Planning, Water quality, Water law, Economic efficiency, Institutions, Legal aspects, Federal government, *Water policy.

During the 1973-1974 academic year, the Virginia Water Resources Research Center offered a noncredit series of seminars, open to all members of the university community and other individuals with water resource interests, concentrating on some of the central issues raised and discussed by the National Water Commission. These seminars were held on a once monthly basis on the campus of Virginia Polytechnic Institute and State University. Seven seminars were held in all, each focusing on one of the National Water Commission topics, and each led by a water resources expert who,

either as a consultant, background study author, or staff member, had a direct involvement in the work of the National Water Commission. This publication contains the text of the formally-delivered part of each seminar leader's presenta-tion recorded onto tapes at the time of presentation and subsequently transcribed and edited. This compilation is made available as an abbreviated and simplified treatment of some of the more significant issues addressed by the National Water Commission. (See W75-00982 thru W75-00988)

THE NATIONAL WATER COMMISSION: AN OVERVIEW OF ITS STRUCTURE AND IN-VOLVEMENT,

Black and Veatch Consulting Engineers, Washington Regional Office, Washington, D.C.

R. E. Fuhrman

In: National Water Commission: A Review of In: National water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia, Bulletin 75. p.1-8, July, 1974.

Descriptors: *National Water Commission, *Water resources development, *Planning, Land use, Federal Water Pollution Control Act, **Federal government, State governments, Water quality control, Water demand, Water supply.

Identifiers: Federal involvement, Social consequences.

The National Water Commission, created by an Act of Congress in Sept. 1968, consisted of 7 businessmen appointed by the President who met monthly for 5 years for the purpose of reviewing water resource development problems and opportunities for the nation as a whole and considering economic and social consequences of water resource development. Its objective was not to weigh the merits of local projects but to determine future national policies to help meet long range water problems. The Commission felt that the resources development; those who benefit by them should pay for them. Federal support of regional water planning through the states as it is done now would be continued, but the Commis-sion emphasized that many of these activities must sion emphasized that many of these activities must take place at the state level. Special provisions for the coordination of any plans by state and federal resource planning agencies should be included in federal legislation for land use planning. Important decisions about land use planning and water resources planning must be integrated. The conclusions of the Commission were made at about the same time that the 1972 Water Pollution Concluded the Amendments were passed by Congress. trol Act Amendments were passed by Congress; it is of interest to note that the 1972 Act is not in accord with the Commission's findings. The Commission's final report (Water Policies for the Fuinission's final report (water Policies for the Put-ture) and a summary report include a great number of recommendations which deserve detailed study. (See also W75-00981) (Diefendorf-North Carolina)

URBAN WATER RESOURCES PLANNING AND MANAGEMENT,
North Carolina Univ., Chapel Hill. Dept. of City

and Regional Planning.
For primary bibliographic entry see Field 6B.
W75-00983

THE CHANGING ROLE OF FEDERAL WATER DEVELOPMENT AGENCIES UNDER MULTI-OBJECTIVE PLANNING AND EVALUATION

Wisconsin Univ., Madison. Dept. of Agricultural

Economics.

D. W. Bromley.
In: National Water Commission: A Review of in: National water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 23-38, July, 1974. 2 fig, 28 ref.

Descriptors: *Water resources development, *National Water Commission, *Recreation, Water resources, Planning, Evaluation, Projects, Cost-benefit analysis, Cost sharing, Land use, US Water Resources Council, Land resources. Identifiers: *Federal water development agencies, National Environmental Policy Act, Multi-objective planning.

The objective is to provide a framework for predicting some parameters of the nation's water development program over the next decade and to place the National Water Commission in proper context as an evolutionary force. Initial discussion involves changes in the demand for water resources projects that hold relevance for the future. Scope of efforts to irrigate the arid West has been reduced, need for water as an input into thermal energy production has increased, structural flood control methods have been deemphasized, and the nature of recreation as a project purpose has changed. In general, large multi-purpose projects are now less in demand. Secondly, the major political forces for a changing federal role in water resources are discussed. Several institutional changes occurred in the 1969-1973 period. The national Environmental Policy Act was passed, the new Principles and Standards for Planning Water and Related Land Resources written by a Water Resources Council task force was signed into effect, and the final report of the National Water Commission was released. Important Commission recommendations pertain to more explicit attention devoted to recreation as a central project purpose, a greater degree of cost sharing by direct project beneficiaries, fewer subsidies to particular regions at the expense of other regions, and the encouragement of an increased role for local, state, regional, and nonwater development federal entities in the use and development of water and land resources. Future water resource planning and evaluation will take place with a greatly expanded notion of the relevant publics and will focus on both monetary and nonmonetary project impacts. (See also W75-00981) (Diefendorf-North Carolina) W75-00984

PROGRAMS AND PROSPECTS FOR WATER POLLUTION CONTROL,

North Carolina Water Resources Research Inst., Raleigh. For primary bibliographic entry see Field 5G. W75-00985

INSTITUTIONAL CHANGES FOR WATER DEVELOPMENT PROJECTS,

New York State Coll. of Agriculture and Life Sciences, Ithaca.

D.J. Allee.

In: National Water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 53-65, July 1974.

*Water resources development, Descriptors: National Water Commission, *Institutions, Political aspects, Decision making, Planning, Project planning, Urbanization, Regional economics, Priorities, *Institutional constraints.

Identifiers: Policy proposals, *Colorado River Basin Bill, Behavioral analysis, Local influence,

Public participation, Revenue sharing, State responsibilities.

In a recent study of the Colorado River Basin Bill (W71-13900), Ingram developed a model that needs only minor modification to serve as a general behavioral hypothesis for the recent politics of water resource development. Over the years procedures have developed to keep the unit of decision as the project and to emphasize these points in the decision structure where the locality has the most influence, with lesser emphasis on technical and economic criteria. Local support and Congressional decision points have not been firmly linked into the formal basin planning process, the national program being based on mutual accommodation between projects. Agencies to demonstrate low levels of controversy, building consent by using extended technical reviews, multiple-objective planning, and public participation programs. But urbanization, ac-ceptance of federal water resource development projects as a legitimate means to achieve local growth objectives, and the threat of the environmental-development issue moving to the national arena point toward change in the traditional water resource development process. Instead of on a project basis, program authorizations and ap-propriations can be based on revenue sharing, regional budgets, public participation, regionalized state involvement. These changes would facilitate the focus of attention on politically meaningful trade-offs and help shift attention away from current decision points in the process to regional mechanisms for priority setting. Report of the National Water Commission lacked any such behavioral analysis and devoted little attention to analysis of the procedures associated with the increase of state roles and responsibilities. (See also W75-00981) (Diefendorf-North Carolina)

PRICING AND EFFICIENCY IN WATER RESOURCES MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 6C. W75-00987

THE CHANGING LAW ON SOCIAL VALUES IN WATER USE,

National Water Commission, Arlington, Va.

In: National Water Commission: A Review of Some Issues, Proceedings of a Seminar Series, P. M. Ashton, ed., Virginia Water Resources Research Center, Blacksburg, Virginia. Bulletin 75, p 76-87, July 1974.

Descriptors: *Public access, *Legal aspects, *Social values, *Water rights, *Recreation demand, Recreation facilities, Flood damage, Land use, Water resources, Public rights, Beaches, Eminent domain, Adverse possession, Low-flow augmentation, Appropriation, Floodplains, Regu-lation, Flood control, Flood protection.

Identifiers: *Public trust doctrine, *Instream water use, *Flood plain management, Shorelands, Legal protection, Enabling acts, Ordinances.

Two major problems that American society facesthe need for additional public recreational facili-ties, ways of getting them, and ways of protecting them and the reduction of losses in life and property due to floods--comprise the 3 topics discussed relating to the wise use of the nation's land and water resources. The first, public rights of access and use of shorelands and beaches for water recreation, is becoming more important as public demand for recreational facilities is burgeoning due to expanding population, more leisure time. and more money to finance leisure activities. Public agencies can acquire the land by eminent domain, by adverse possession or prescription, by recorded private permission, or by the public trust doctrine whereby shores of any navigable stream are subject to public access and use. Secondly, the need for legal protection of instream water use is discussed. The major valuable instream uses include aesthetic value, recreation, fish and wildlife habitat, and preservation of water quality due to its self-purifying capacity. Existing legal obstacles especially in the western states to protect instream water uses, particularly the difficulty in acquiring a water right for low-flow augmentation due to the appropriation doctrine, need to be removed. The third topic covered is the need for floodplain management programs, including nonstructural measures based on state and local regulation of the use and occupancy of floodways and floodplains to supplement the building of levees, dams, and

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reservoirs for flood control and flood protection. State and local adoption of enabling acts and local ordinances are encouraged. (See also W75-00981) (Diefendorf-North Carolina) W75-00988

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: FOX RIVER -LAKE WINNEBAGO, CITY OF OSHKOSH, WINNEBAGO COUNTY, WISCONSIN.

Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 4A. W75-00989

FLOOD PLAIN INFORMATION, CLEAR FORK AND ELK CREEK, JELLICO, TENNESSEE. Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00990

FLOOD PLAIN INFORMATION, MILL CREEK, SEVEN MILE CREEK, NASHVILLE, TENNES-

Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00991

FLOOD PLAIN INFORMATION, CUMBER-LAND RIVER, POOR, CLOVER AND MARTINS FORKS, AND CATRON CREEK, HARLAN, KENTUCKY.

Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00992

FLOOD PLAIN INFORMATION, CUMBER-LAND RIVER, RICHLAND AND FIGHTING CREEKS, BARBOURVILLE, KENTUCKY. Army Engineer District, Nashville, Tenn. For primary bibliographic entry see Field 4A. W75-00993

FLOOD PLAIN INFORMATION, LITTLE BUSHKILL CREEK, AND SHOENECK CREEK, NORTHAMPTON COUNTY, PENNSYLVANIA. Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 4A. W75-00994

FLOOD PLAIN INFORMATION, CRUM CREEK, DELAWARE COUNTY, PENNSYL-

Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 4A. W75-00995

FLOOD PLAIN INFORMATION: DENHALL RIVER, JUNEAU, ALASKA. Army Engineer District, Anchorage, Alaska For primary bibliographic entry see Field 4A. W75-00996

FLOOD PLAIN INFORMATION, POOR FORK, CLOVERLICK CREEK AND LOONEY CREEK, CUMBERLAND, KENTUCKY. Army Engineer District, Nashville, Tenn For primary bibliographic entry see Field 4A.

A METHODOLOGY FOR PLANNING LAND USE AND ENGINEERING ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT: THE FLOOD PLAIN MANAGEMENT SYSTEM MODEL, Arizona Univ., Tucson.
R. N. Weisz, and J. C. Day.

Report, submitted to U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., IWR Paper 74-P2. April 1974. 271 p, 13 fig, 27 tab, 143 ref, 4 append.

Descriptors: *Flood plains, *Management, *Land use, *Linear programming, *Alternative planning, *Arizona, Economic rent, Computer models, Decision making, Engineering, Analytical techniques, Economic efficiency, Constraints, Optimization, Comprehensive, planning, Mathe-Optimization, Comprehensive planning, Mathematical models, Systems analysis. Identifiers: Sensitivity analysis, Pima Coun-

Presented is the empirical development and exploration of an economic methodology for flood plain management. An economic approach to planning and evaluating land use and engineering alternatives is derived. The concept of economic rent is utilized to indicate the economic efficiency of planning alternatives. Linear programming is used in a computer-oriented Floodplain Manage-ment System (FMS) Model to select the optimal combination of land use regulations, development combination or iand use regulations, development policies, and engineering measures that will maximize an overall economic efficiency objective subject to various physical and institutional constraints. The FMS model is applied to a flood plain management problem in Pima County, Arizona, determining the most economically efficient combination of: (1) spatial and temporal distribution of the plant was (2) site elevation through dist fill: urban land uses; (2) site elevation through dirt fill; (3) floodproofing; (4) public acquisition of undeveloped land for open space uses; (5) public acquisition and removal of existing improvements from flood plain; (6) dams; and (7) channel improvements. The FMS model provides a means of bringing together, bydrologic engineering bringing together hydrologic, engineering, economic and other data related to those planning alternatives it examines. (See also W74-10277) (Bell-Cornell) W75-01002

6G. Ecologic Impact Of Water Development

DISTRIBUTION PATTERNS OF MUDFLAT VEGETATION IN IOWA FLOOD CONTROL RESERVOIRS,

Iowa State Univ., Ames. Dept. of Botany and Plant Pathology. For primary bibliographic entry see Field 2I. W75-00705

LEGAL COMPILATION-STATUTES AND LEGISLATIVE HISTORY, EXECUTIVE OR-DERS, REGULATIONS, GUIDELINES AND RE-PORTS (PESTICIDES) VOL. 1, II, III. Environmental Protection Agency, Washington, D.C. Office of Legislation. For primary bibliographic entry see Field 5G. W75-00728

THE NATIONAL ENVIRONMENTAL POLICY ACT AS A FULL DISCLOSURE LAW, Cornell Univ., Ithaca, N.Y. Cornell Energy Pro-For primary bibliographic entry see Field 6E. W75-00730

ENVIRONMENTAL EVALUATION, BOISE DISTRICT, BUREAU OF LAND MANAGEMENT, Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5G. W75-00731 Region X.

CONFINED DISPOSAL FACILITY AT POINTE MOUILLEE FOR THE DETROIT AND ROUGE RIVERS (DRAFT ENVIRONMENTAL STATE-United States Lake Survey, Detroit, Mich.

For primary bibliographic entry see Field 5G.

REVIEW REPORT ON THE COLUMBIA-NORTH PACIFIC REGION CONPREHENSIVE FRAMEWORK PLAN (FINAL ENVIRONMEN-TAL IMPACT STATEMENT). Pacific Northwest River Basins Commission, Van-

For primary bibliographic entry see Field 6B. W75-00733

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR ARMY MILITARY PROGRAMS, Army Construction Engineering Research Lab., Champaign, Ill. R. K. Jain, T. A. Lewis, L. V. Urban, and H. E.

Available from the National Technical Informa-Available Holm the National Technical Information Service, Springfield, Va. 22161, as AD-771 062, \$6.25 in paper copy, \$2.25 in microfiche. December 1973. 169 p. 48 ref, 12 tab, 25 fig.

Descriptors: *Computer programs, *Administrative decisions, *Data processing, *Military aspects, Legislation, Decision making, Project planning, Military reservations, Administrative practices, Comprehensive planning, Education cation, Management, Operations research, Federal government, Short term planning, Auto-mation, Methodology, Research and development, Environmental effects, Data storage and retrieval,

Adoption of practices.

Identifiers: *National Environmental Policy Act,
*Administrative regulations, *Environmental Impact Statements.

The National Environmental Policy Act of 1969 requires the United States Army, as well as all other federal agencies, to compile an environmental impact assessment (EIA) to be formulated for any activity which might have a substantial impact on the environment. The EIA is essentially for intra-agency circulation, but if it reveals any substantial impact, then a more formal environmental impact statement (EIS) is required. A format and guide to assessing and compiling the EIA or the EIS with computer assistance are presented. The wide range of Army programs that potentially affect the environment together with the broad range of types and degrees of impact possible make great use of computer technology in the field. Given appropriate input on the considered program the computer will list probable environmental effects of the program, the sources of those effects, information on mitigating or eliminating the impact, identification of the most controversial aspects, and a cross-reference to pertinent state or federal legislation. The computer will not have a decisionmaking function. Its use for speedy and thorough analysis of the many interrelated issues involved in impact assessment should provide higher quality information to administrative personnel upon which their decisions may be based. (Salley-W75-00735

LEGAL ASPECTS OF THE ENVIRONMENT, Best, Best and Krieger, Riverside, Calif. J. H. Krieger.

Journal of the American Water Works Association, p 532-537, August 1973. 6 p. 6 ref.

Descriptors: *Administrative agencies, *Legislation, Environmental effects, *Federal government, *Regulation, Permits, Discharges, Environment, Economic impact, Legal aspects, Power plants, Navigable waters, Nuclear powerplants, Wastes, Discharges(Water), Resources, Utilities, Pipelines, Navigation, Natural resources, Conservation, Resources development, Adoption of practices.
Identifiers: *National Environmental Policy Act,

*Environmental impact statements, *Refuse Act of 1899, Atomic Energy Act, Administrative regu-lations, Environmental policy.

The National Environmental Policy Act (NEPA) The National Environmental Policy Act (NEXP) requires that all federal agencies disclose the effect that their proposed actions will have on the environment. The agencies are required to prepare environmental impact statements which are filled with the Council on Environmental Quality before taking any action. NEPA prescribes an elaborate review process for the examination of these statements by all federal agencies concerned, as well as by the public. The comments of all interested parties are reviewed by the agency that prepared the statement before the agency can take the requested action. The area of nuclear power plants, however, has required relief from the strict requirements of NEPA. Because of increasing community demands for power, strict compliance in that area has been relaxed through amending the Atomic Energy Act. A number of courts now are disposed to construe other laws in the spirit of NEPA. More and more legislation authorizing citizen suits and class actions has been enacted as a result of NEPA. Generally, this has been a well received piece of legislation. (Chennault-Florida) W75-00737

THE CHALLENGE OF THE ENVIRONMENT: A PRIMER ON EPA'S STATUTORY AUTHORITY. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 6E. W75-00738

DEVELOPMENTS IN WATER UTILITY LAW. American Bar Association, Washington, D.C., Subcommittee on Water Resources. For primary bibliographic entry see Field 5G.

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 8A. W75-00929

KNIFE LAKE IMPROVEMENT RC AND D MEASURE ONANEGOZIE RC AND D PRO-JECT, KANABEC COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATE-MENT),

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 4A. W75-00930

DIKED DISPOSAL AREA, BUFFALO RIVER, BUFFALO HARBOR, BLACK ROCK CHANNEL, TONAWANDA HARBOR, ERIE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Buffalo, N. Y.

For primary bibliographic entry see Field 5G. W75-00931

CRAWFORD CREEK SUBWATERSHED PRO-JECT, LITTLE SIOUX RIVER WATERSHED, IDA COUNTY, IOWA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Des Moines, Iowa. For primary bibliographic entry see Field 4D. W75-00935

STATE PARTICIPATION IN NPDES. For primary bibliographic entry see Field 5G. W75-00940

GOVERNMENTAL REORGANIZATION FOR NATURAL RESOURCES PROTECTION. For primary bibliographic entry see Field 6E. W75-00957

REGIONAL ANALYSIS FOR DEVELOPMENT PLANNING IN DISASTER AREAS.

Cornell Univ., Ithaca, N.Y. Center for Urban Development Research. B. G. Jones, and J. H. Mars.

Available from NTIS, Springfield, Va 22161 as PB-237 163, \$5.25 in paper copy, \$2.25 in microfiche. Technical Report No. 88. Joint publi-cation of: Water Resources and Marine Sciences Center, Department of Natural Resources, and Center for Urban Development Research, Cornell University, September 1974. 137 p, 16 fig, 44 tab, 5 maps, 16 ref. OWRT A-045-NY(3).

Descriptors: *Regional analysis, *Planning, Regional development, *Flood damage, *New York, *Model studies, Methodology, Analytical techniques, Human population, Economics, Employment, Social aspects, Computers, Data collections. Systems analysis.

tions, Systems analysis.
Identifiers: Natural disasters, *Disaster areas,
Post-disaster planning, Relief activities, Policy
making, Flood management, Residential population, Industrial structure.

In post-disaster situations, a critical issue is the rapid development of policy guidelines for relief, recovery, and reconstruction efforts that will assist and precipitate social and economic developments. Needed are a methodology using readily available published data and producing readily understandable and usable results, and a relatively simple computer analysis to process the data and provide a comprehensible output. This re-port explores the development of an inexpensive and rapid analytical procedure that can aid, in a limited way, the development of normative policy guidelines early in the design and formulation of relief efforts in the emergency atmosphere that characterizes immediate post-disaster situations. A set of three interrelated analytical methods are devised. Three models are developed, the first dealing with trends in changes of residential population distribution throughout the region over time. The second deals with changes in employment structure and the mix of economic activities in the region over time, and the third considers trends in the changing size of establishments in various sectors of the economy. The methods are applied to the three-county region of Chemung, Steuben, and Schuyler Counties, on which the floods accom-panying Hurricane Agnes in 1972 had the most severe impact in New York State. (Bell-Cornell)

LIMNOLOGICAL GUIDANCE FOR FINGER LAKES MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources; and New York State Coll. of Agriculture and Life Sciences, Ithaca. For primary bibliographic entry see Field 5G. W75-00971

A MODEL FOR SIMULATING RIVER AND RESERVOIR TEMPERATURES WITH APPLI CATIONS FOR ANADROMOUS MANAGEMENT,

Oregon State Univ., Corvallis. Dept. of Civil Engineering. For primary bibliographic entry see Field 5C. W75-00978

LAND-USE PLANNING, Connecticut Univ., Storrs. Coll. of Agriculture and Natural Resources. For primary bibliographic entry see Field 6B. W75-01005

STRIP-MINE REGULATION AND RECLAMA-TION: AN ATTITUDE SURVEY, Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Economics. For primary bibliographic entry see Field 6B. W75-01028

7. RESOURCES DATA

7A. Network Design

SUMMARY OF PLANS FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1975. Geological Survey, Reston, Va. Office of Water

Data Coordination. April 1974. 29 p, 2 fig, 4 tab, 3 append.

Descriptors: *Data collections, *Hydrologic data, *Information exchange, *Federal government, Research priorities, Data storage and retrieval.

Activities in water data collection planned for 1975 FY by all Federal agencies are summarized. The information was obtained through the field-level review and coordination of water-data acquisition activities of Federal agencies together with input at the headquarters level regarding activities of National scope. Agency representatives reported proposed changes in their agency's current waterrelated activities, including plans for discontinuance of stations and addition of new stations through 1975 FY where applicable. They also noted principal areas of data deficiencies. Water data are required in excess of those currently being collected. Foremost among these needs is additional water-quality data relating to the effects on the environment of man's activities. Also, a need was expressed in many regions for more streamflow and stage data in small drainage areas for planning and design purposes. Flood frequency and flood profile information in urban and suburban areas are other needs stressed. Demand for special water-resources investigations and addional water data as a result of the energy crisis is already evident. (Knapp-USGS) W75-00617

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF NINTH MEETING, MAY 21-23, 1974, SIOUX FALLS, SOUTH DAKOTA.

Geological Survey, Reston, Va. Office of Water Data Coordination. Report, 1974. 42 p.

Descriptors: *Hydrologic data, *Data collections, *Conferences, Data storage and retrieval, Remote sensing, Urban hydrology, Water resources development, Energy.

The ninth meeting of the Advisory Committee on Water Data for Public Use was held in May 1974 in Sioux Falls, South Dakota. The meeting agenda, a list of Committee members and observers, and the full Committee membership are included. The topics discussed were data needs for urban hydrology, energy, and water quality control, as well as new systems for data collection, storage, and retrieval. (Knapp-USGS) W75-00626

SUPPORT IN THE OVERALL DESIGN DEVELOPMENT OF A NATIONAL WATER EXCHANGE (NAWDEX): FINAL REPORT (JANUARY-DECEMBER 1973), PRC Systems Sciences Co., McLean, Va. F. D. Mason.

Report No PRC R-1696, January 8, 1974, 165 p. 3 ref, 2 append. USGS-14-08-0001-13499.

Descriptors: *Data collections, *Information exchange, *Information retrieval, *Data storage and retrieval, *Hydrologic data, Data processing, Basic data collections, Design criteria. Identifiers: NAWDEX, Information systems.

Overall design development of a National Water Data Exchange (NAWDEX) is described. A system design for NAWDEX was prepared based on previous efforts of the U.S. Geological Survey,

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Group 7A-Network Design

Internal Expertise in Water Data Systems, and the results of a national survey of the water data community. An implementation plan was also prepared which can be used to transform the recommended design into an operating entity. The NAWDEX design includes an organizational structure featuring a system central with overall management responsibility linking together participants from throughout the water data community. Operationally, systems central would provide an index to water data and certain limited data services with the bulk of the actual data exchange being effected by member agencies. Nominal charges for data requests and services are recommended as is Federal funding of all fiscal and routine operating costs. (See also W74-06350) (USGS)
W75-00708

THE RELATION OF RAINFALL NETWORK DENSITY TO ACCURACY OF RUNOFF PRE-DICTION IN A MOUNTAINOUS BASIN, Colorado State Univ., Fort Collins.

S. Jacobi, and D. R. Dawdy.
In: Distribution of Precipitation in Mountainous Areas; Proceedings of Geilo Symposium, Norway, July 31-August 5, 1972: World Meteorological Organization Publication No 326, Volume I, p 214-218, 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Rain gages, *Network design, *Data collections, *Rainfall-runoff relationships, *Mathematical models, Hydrologic data, Hydrographs, Peak discharge, Simulation analysis, *California.

Three recording rainfall gages in a 9.7-square-mile basin in southern California were used with a deterministic rainfall-runoff model to simulate flood hydrographs and peaks. The gain in accuracy or simulation achieved by using increasing amounts of data is discussed in terms of data requirements. A segmented basin model extracts no more information from the rainfall data used than does a Thiessen weighted input to a nonsegmented model. The approximations which are contained in a bulk-parameter rainfall-runoff simulation model do not seem to be the limiting factor as far as accuracy of simulation is concerned. The ability to model has outrun ability to collect data accurate enough to test the models. More accurate data measurements are required in time and space. The user of the simulation results should determine for his use whether the extra accuracy gained by more rainfall input information is worth the extra cost incurred to obtain that information. (Knapp-USGS) W75-00807

7B. Data Acquition

A FEASIBILITY STUDY FOR A MOBILE SUB-MERSIBLE VEHICLE TO BE USED FOR THE CONTROL MANAGEMENT, STUDY OF NATU-RAL PROCESSES, PROTECTION AND CON-SERVATION OF INLAND WATER, CORTELLISI, USERS N.Y.

Cornell Univ., Ithaca, N.Y.
D. Yancey, E. T. Cranch, and S. Lathrop.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 914,
\$4.25 in paper copy, \$2.25 in microfiche. Completion Report Water Passara and Marian tion Report, Water Resources and Marine Sciences Center, Cornell University, Ithaca, N.Y., September 1974.65 p. 2 tab. OWRT A-033-NY(1). Identifiers: "Submersible vehicles, Aquatic biolo-

Presented is a feasibility study of the use of submersible vehicles in lake and estuarine research. Several systems, including surface ships, scuba diving, buoys, and underwater habitats, are compared with submersibles for their research capa-bility before deciding upon a particular design. General design criteria for a small research submersible, safety precautions for design and opera-tion, and instrument design and selection criteria are viewed in some detail. The remainder of the report considers parameters of interest to the aquatic biologist: dissolved gases; nutrients; vitamins; amino acids; pigments; and trace minerals and metals. Discussed are radioactivity, chemical analytical techniques, biota study, physical parameters (temperature), bottom studie rents and current meters, underwater photography, and sonar as a non-navigational tool. Submersibles possess extensive capabilities for research in chemical and thermal pollution control, basic limnology, and aquatic agriculture. (Bell-Cornell) W75-00556

OBSERVATIONS OF WATER, AIR AND SOIL POLLUTION IN ISRAEL AND VICINITY FROM THE ERTS-L IMAGERY,

Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences. For primary bibliographic entry see Field 5A. W75-00596

METHOD FOR THE MONITORING OF LIQUID FLOW AND AN AUTOMATIC FLOW CONTROLLER TO BE USED FOR THIS METHOD. Canadian Patent 948,737. Issued June 4, 1974. Patent Office Record, Vol 102, No 23, p 23-84,

Descriptors: *Patents, *Monitoring, Liquids, Flow, Pressure, Pipes, Automation, Control, Installation, Pollutant identification. Identifiers: *Pressure detectors, Alarm systems.

A method is detailed for the monitoring of a liquid flow by means of two pressure detectors installed in different horizontal planes of a non vertical pipe. These pressure detectors trip an alarm system by comparing their outputs if a given flow value is not attained. The invention also concerns an automatic flow controller comprising two resistance strain gauges which are installed in a pipe. These are arranged one above the other and an electronic alarm circuit supplying the resistance strain gauges compares their data and trips an alarm system as soon as the liquid content of the pipe falls below a specified value. (Prague-FIRL) W75-00602

DETECTING PARTICLES IN LIQUIDS. Emhart Corp. Sydney (Australia). For primary bibliographic entry see Field 5A. W75-00614

WATER-POLLUTION ASSESSMENT ASTM COMMITTEE D-19, Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5A.

PROCEEDINGS OF NAVAL ENVIRONMENTAL PROTECTION DATA BASE, INSTRUMENTA-TION WORKSHOP. For primary bibliographic entry see Field 5A. W75-00644

INSTRUMENTATION FOR WATER AND WASTEWATER ANALYSES, National Environmental Research Center, Cincinnati. Ohio. For primary bibliographic entry see Field 5A. W75-00645

INSTRUMENTATION FOR UNDERWATER NUCLEAR RADIATION MEASUREMENTS, Naval Undersea Center, San Diego, Calif. For primary bibliographic entry see Field 5A.

WASTEWATER INSTRUMENTATION, Air Force Weapons Lab., Kirtland AFB, N. Mex. Environics Lab. For primary bibliographic entry see Field 5A. W75-00647

TESTING OF WATER QUALITY INSTRUMEN-TATION AT NOIC, National Oceanographic Instrumentation Center, Rockville, Md. For primary bibliographic entry see Field 5A. W75-00652

ANALYSIS OF MERCURY, LEAD AND OTHER METALS IN ENVIRONMENTAL SAMPLES. Naval Undersea Center, San Diego, Calif. Chemical Oceanography Branch.
For primary bibliographic entry see Field 5A.
W75-00657

BIOLOGICAL FIELD METHODS. Naval Underwater Systems Center, Newport, R.I. Dept. of Ocean Science. For primary bibliographic entry see Field 5A. W75-00659

OIL-IN-WATER MONITORING AND MEASUR-Naval Ship Research and Development Center, Annapolis, Md. For primary bibliographic entry see Field 5A. W75-00662

AERIAL COASTAL OCEANOGRAPHY AND POLLUTION SURVEILLANCE, Naval Underwater Systems Center, New London, For primary bibliographic entry see Field 5A. W75-00663

THE DETERMINATION OF FORMALDEHYDE AND RELATED COMPOUNDS IN WATER AND INDUSTRIAL EFFLUENTS, Canada Centre for Inland Waters, Burlington (Ontario). For primary bibliographic entry see Field 5A. W75-00713

SENSITIVE TIPPING-BUCKET RAIN GAUGE Army Electronics Command, Fort Monmouth, N.J. Communication/ADP Lab. For primary bibliographic entry see Field 2B. W75-00743

INSULATION AGAINST ICE AT MEASURING Norges Tekniske Hoegskole, Trondheim Div. of Hydraulic Engineering. For primary bibliographic entry see Field 2C. W75-00750

THE DEVELOPMENT OF HYDROLOGICAL CONCEPTS IN BRITAIN AND IRELAND BETWEEN 1674 AND 1874, University Coll., Dublin (Ireland). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-00754

RADIO-FREQUENCY INTERFEROMETRY-A NEW TECHNIQUE FOR STUDYING GLACIERS,
National Aeronautics and Space Administration,
Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 2C.
W75-00768 SNOWPACK CALIBRATION ON MARMOT CREEK TO DETECT CHANGES IN ACCUMU-LATION PATTERN AFTER FOREST-COVER MANIPULATION, Northern Forest Research Center, Edmonton

Adherta).
D. L. Golding.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 1, p 82-95, 1973. 3

Descriptors: *Water equivalent, *Water yield, *Snow surveys, *Snowpacks, Mountain forests, Calibrations, Data collections, Streamflow forecasting, Runoff forecasting, Rocky Mountain Region, *Canada.
Identifiers: *Marmot Creek Watershed(Alberta).

Snow accumulation changes resulting from watershed treatment were calculated using the calibration procedure commonly used in detec streamflow changes from a treated watershed. Ninety-five samples, each of which was the mean of five adjacent point measurements of snowwater equivalent, on two subbasins on Marmot Creek experimental watershed, were calibrated with the mean water equivalent of the control subbasin. With a 5-year calibration period, median values of the minimum significant difference at the 90% level of probability were 0.81 cm and 1.11 cm. No improvement was gained by using control blocks selected to compare with blocks on the treatment subbasin instead of mean water equivalent of the whole control subbasin. A test of one block gave as good a calibration using in-dividual point measurements as using the mean of five adjacent points, the advantage being an im-provement in snow pattern differentiation. (See also W75-00809) (Knapp-USGS) W75-00817

FIELD MEASUREMENTS ON THE FLUX OF WATER VAPOUR THROUGH DRY SNOW, Alaska Univ., College. Geophysical Inst. and Alaska Univ., College. Dept. of Geology. C. S. Benson, and D. C. Trabant.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 291-298, 1973.

Descriptors: *Mass transfer, *Water vapor, *Snowpacks, Diffusion, Convection, Temperature, Crystal growth, Avalanches. Identifiers: *Depth hoar.

Extreme development of depth hoar occurs in the shallow (50-80 cm) seasonal snowpacks of interior Alaska. An experimental arrangement employed at the University of Alaska, Fairbanks, shows the formation of depth hoar and the associated vapor flux in the natural snowpack, which is subjected to strong temperature gradients. The measured up-ward vapor fluxes in the snow during four succesward vapor riuxes in the show during four successive years averaged 0.025 g per sq cm per day. This is an order of magnitude greater than vapor fluxes calculated from pure diffusion models. To date, all theoretical models for depth hoar formation have been diffusion models, which specifically exclude the process of air convection in snow. Significant convection of air occurs in the snow and should be considered in models of depth hoar formation. (See also W75-00809) (Knapp-USGS) W75-00828

ALPINE GLACIER STUDIES WITH NUCLEAR METHODS,

Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs. F. A. Prantl, W. Ambach, and H. Eisner.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological

Sciences Publication 107, Vol 1, p 435-444, 1973. 1

Descriptors: *Glaciohydrology, *Water balance, *Tracers, Stratigraphy, Radioisotopes, Tritium, Fallout, Radioactivity techniques, Glaciers, Al-

Glaciological mass balance may be studied using a nuclear method for identifying and dating annual horizons and net accumulations by variations of fission product activities. A dynamic multilayer model of radionuclide redistribution during summer ablation is proposed and found to be in agreement with the existing experimental data. The redistribution enhances annual horizon activities. This suggests that artificial replenishment of horizon activities with suitable radioactive tracers can be used if the radioactivity of atmospheric fallout from nuclear weapons testing declines. (See also W75-00809) (Knapp-USGS) W75-00839

METHODS OF MEASURING SNOW COVER, SNOWMELT, AND STREAMFLOW UNDER WINTER CONDITIONS,

National Weather Service, Silver Spring, Md. E. L. Peck.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 582-597, 1973.

Descriptors: *Snowmelt, *Snow cover, *Streamflow, *Flow measurement, *Snow surveys, Stream gages, Stage-discharge relations, Reviews, Ice cover, Discharge measurement. Identifiers: *Snow hydrology.

A brief review of the methods of measuring snow cover, snowmelt and related meteorological parameters, and streamflow under winter conditions is presented. Emphasis is directed to more recently evolved methods, including airborne sensors and satellite techniques. Errors associated with the various methods are discussed as well as the problems of areal representativeness, network efficiency, and design. (See also W75-00809) (Knapp-USGS) W75-00852

SNOW PLATE EXPERIMENTS ON STANDARD RAIN-GAUGE DEFICIENCY DURING SNOW-FALL.

Finnish Meteorological Office, Helsinki.

U. I. Helimaki, and A. Lange. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 664-669, 1973. 5

Descriptors: *Precipitation gages, *Snowfall, Rain gages, Snow surveys, Sampling, Water equivalent, Data collections, Hydrologic data. Identifiers: *Finland.

Snowfall is measured in Finland by means of the snow plate. This instrument, a sheet metal disc 35 cm in diameter is laid on the surface of the snow. From the center of this plate a steel rod, 50 cm long, is attached, which has a twofold purpose: it aids in the rediscovery of the plate when buried in snow; secondly it functions as a guiding device when taking a snow sample on the plate. To examine the measuring ability of a normal rain gage when employed for snowfall, the snow plate is used as a reference measuring system. The local horizontal momentum of snow during snowfall is a good predictor of the rain-gage deficit. Correlation of the regression model was as much as 0.9377. (See also W75-00809) (Knapp-USGS) W75-00858 RANDOM SAMPLING TECHNIQUE IN MEA-SURING SNOW-WATER EQUIVALENT IN A DRAINAGE BASIN, Copenhagen Univ., (Denmark). Dept. of Geog-

B. Hasholt.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 680-687, 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Snow surveys, *Water equivalent, *Sampling, Water yield, Snowfall, Snow cover, Snowpacks.
Identifiers: *Denmark.

Measuring equipment was developed for deter-mining water equivalent of snow where there is a thin snow cover. Snow depth, density, and water equivalent are measured at points in a drainage basin chosen at random. A sample of snow is taken with a plastic tube with an inside diameter of 60 mm and length of 250-500 mm. A random sampling technique is used because the distribution of snow cover is unknown, and because this technique permits calculation of the uncertainty of the results. (See also W75-00809) (Knapp-USGS) W75-00860

A NETWORK OF TELEMETERED PROFILING ISOTOPIC SNOW GAUGES, Aerojet Nuclear Co. Idaho Falls, Idaho.

P. D. Randolph, R. A. Coates, E. W. Killian, L. O. Johnson, and R. L. Heath.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 688-701, 1973. 4

Descriptors: *Precipitation gages, *Snowpacks, *Nuclear moisture meters, *Water equivalent, *Telemetry, Automation, Profiles, Radioactivity

Isotopic snow gages were fabricated and installed for testing in the western mountain states of the U.S. These gages are operated via telephone as a telemetered network by a small computer from a single base station at the National Reactor Testing Station in Idaho. They can sample a snowpack at 9.5 cm/minute in 1.27-cm steps. Two parallel vertical tubes contain a small radioactive source and a detector which are simultaneously lifted from the top by a small motor. The attenuation of radiation by the snow layer is measured. The base station computer completely controls gage operation. Remote telemetered operation of a profiling gages was successfully demonstrated. (See also W75-00809) (Knapp-USGS) W75-00861

PRACTICAL USE OF AIRCRAFT GAMMA-RAY SURVEY OF SNOW COVER IN THE USSR, Hydrometeorological Service of the USSR, Moscow

A. V. Dmitriev, R. M. Kogan, M. V. Nikiforov,

and Sh. D. Fridman.
In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 702-712, 1973. 4 fig, 2 tab, 4 ref.

Descriptors: "Snow surveys, "Snowpacks, "Gamma rays, "Remote sensing, Radioactivity techniques, Nuclear moisture meters, Water equivalent, Snow cover, Aircraft. Identifiers: "USSR.

An airborne gamma-ray technique for surveying snow cover was designed for mapping the water equivalent of snowpack in fields and forests. The region of application is flat or hilly terrain with elevations to 400 m, with not more than 60% marsh

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Group 7B—Data Acquition

covered, with ravines up to 10%, and water equivalent from 10 to 300 mm. (See also W75-00809) (Knapp-USGS)

SNOWPACK WATER CONTENT BY REMOTE SENSING

National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center. W. I. Linlor.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 713-726, 1973. 8 fig. 12 ref.

Descriptors: *Remote sensing, *Water equivalent, *Snowpacks, *Snow surveys, Radar, Aircraft, Microwaves, Snow cover.

Snowpack water content by remote sensing is based on a layered model consisting of air, snow, ice, water, and earth. The reflection coefficient for a normally incident plane electromagnetic wave was computed at various frequencies. The water content of the snow layer and thickness of the ice can be obtained from the shape of the curve of reflection coefficient versus frequency. An ap-proximate explanation is given in terms of a three-layer model. Other systems for electromagnetic remote sensing and snow electrical properties are reviewed. Possible airborne applications of the proposed electromagnetic system are outlined. (See also W75-00809) (Knapp-USGS) W75-00863

REMOTE SENSING OF WATER CONTENT OF SNOW COVER AT ONE POINT OR MORE IN A MOUNTAIN AREA,

Deutscher Wetterdienst, Hohenpeissengerg (West Germany). Meteorologisches Observatorium. W. Attmannspacher, and J. Riedl.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 727-733, 1973. 6

Descriptors: *Water equivalent, *Snowpacks, *Nuclear moisture meters, *Telemetry, Automa-tion, Data collections, Snow cover, Water yield,

Equipment for remote sensing of the water content of a snow cover by gamma radiation was designed to operate without maintenance during the period of late autumn, winter, and spring. By the period of late autumn, winter, and spring. By using a CS-137 source with a half-life of 30 years, practically no correction has to be made for decreasing activity during the time of measurements: normally 6-8 months. Above the source, at approximately 5 meters altitude, is a Geiger counter. Only the step from pulse 9999 to 10,000 is transmitted to a central station. In this way it is care to record the time necessary to get 10,000 ml. easy to record the time necessary to get 10,000 pulses. As many as six field stations can be handled from the central station. (See also W75-00809) (Knapp-USGS) W75-00864

SNOW MEASUREMENT USING MILLIMETRE

WAVELENGTHS,
Alaska Univ., College. Inst. of Arctic Environmental Engineering.
R. C. Byrd, M. C. Yerkes, W. M. Sackinger, and T.

E. Osterkanp.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 734-738, 1973. 4 fig, 3 ref. ONR Contract N00014-71-A-0365-0001.

Descriptors: *Snow cover, *Snowpacks, *Remote sensing, *Radar, Microwaves, Snow surveys, Data collections, Calibrations, Aircraft, Mapping,

Remote sensing of snow cover using side-looking airborne radar can provide quick comprehensive information about snow depth, density, and water content. For resolution on the order of several meters, and for reasonable antenna dimensions, wavelengths of 1 centimeter or smaller are required. Measurements are reported of the radiation backscattered from snow-covered land and lake ice, taken as a function of incidence angle. Liquid water content is a dominant factor, together with resonant effects in snow layers and large crystals. (See also W75-00809) (Knapp-USGS) W75-00865

MEASUREMENT OF SNOW COVER USING PASSIVE MICROWAVE RADIATION, Geological Survey, Tacoma, Wash M. F. Meier.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 739-750, 1973. 4

Descriptors: *Snow surveys, *Microwaves, *Remote sensing, Snowpacks, Alpine, Radar, Albedo, Temperature, Snow cover, *Washington. Identifiers: Mt Rainier(Wash).

Passive microwave emission has great potential for measuring snow distribution. The snowline mapped from air photographs of Mount Rainier on June 18, 1968, is almost identical with 270 K brightness temperature shown on a microwave image. The snow-covered area can be calculated from an average brightness temperature for any field of view. The low resolution limitation of microwave imagers, therefore, is not of any practical importance. (See also W75-00809) (Knapp-W75-00866

DETECTING MELTING SNOW AND ICE BY VISIBLE AND NEAR-INFRARED MEASURE-MENTS FROM SATELLITES, National Environmental Satellite Service,

D. F. McGinnis. In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 751-761, 1973. 5

Descriptors: *Snowmelt, *Ice cover, *Remote sensing, *Infrared radiation, *Satellites(Artificial), Snowpacks, Snow cover, Flood forecasting, Ice

Melting snow and ice may be detected with nearinfrared data in conjunction with reflected visible radiation. Snow and ice are highly reflective in both the visible and near-infrared areas of the electromagnetic spectrum. Under melting conditions, near-infrared aradiation is strongly absorbed, whereas visible radiation is strongly reflected. Comparison of simultaneous visible and near-infrared imagery from the Nimbus III satellite provides a method for monitoring the melting of snow and ice that may be applied to snowpack-runoff prediction, flood forecasting, and lake navigation. prediction, 11000 forecasting, and lake navigation. Several examples (Lake Winnipeg, the Alps, and northwest Canada) are provided to illustrate the use of this spectral difference. (See also W75-00809) (Knapp-USGS) W75-00867

MEASUREMENT OF DISCHARGE UNDER ICE

Water Survey of Canada, Winnipeg (Manitoba). P. W. Strilaeff.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological

Sciences Publication 107, Vol 1, p 797-813, 1973. 11 fig, 2 tab, 13 ref.

Descriptors: *Discharge measurement, *Ice cover, *Stage-discharge relations, Stream gages, Arctic, Canada, Streamflow, Ice, Slush, Equipment, Velocity, Flow measurement.

Many difficulties are involved in the measurement of discharge under ice cover, particularly in arctic and subarctic regions. Difficulties result from extreme ice thickness, double layers of ice, large depths of slush ice, coincidence of spring flows depths of slush ice, coincidence of spring flows with ice breakup, and freezeup of gaging equipment in sub-zero temperatures. Some of the procedures used in the operation of networks in northern areas of Canada are outlined. A technique for estimation of river discharge using a single velocity in a cross-section is brief described. (See also W75-00809) (Knapp-USGS) W75-00870

WINTER MEASUREMENTS OF SUSPENDED SEDIMENTS,

Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 2J. W75-00871

BASIN-WIDE WATER EQUIVALENT ESTIMA-TION FROM SNOWPACK DEPTH MEASURE-

MENTS, Ontario Ministry of the Environment, Toronto. Water Quantity Management Branch. For primary bibliographic entry see Field 4A. W75-00874

FORECASTING RUNOFF FROM UNIVERSAL SURFACE GAUGE SNOWMELT MEASURE-MENTS.

Agricultural Research Service, Boise, Idaho. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 4A. W75-00892

UTILITY OF IMAGING RADAR FOR THE STUDY OF LAKE ICE.

Michigan Univ., Ann Arbor. Dept. of Geography.

M.L. Bryan.

In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 2, p 1339-1349, 1973.
2 fig, 1 tab, 26 ref. NASA Contract Nas5-21783.

Descriptors: *Lake ice, *Iced lakes, *Remote sensing, *Radar, Microwaves, Ice cover, Data collections, Surveys.

Side-looking airborne radar is the best of several remote sensing systems available for the surveil-lance of ice and snow. Most other systems suffer from their present restriction to the visible and infrared portions of the electromagnetic spectrum. Sidelooking airborne radar (SLAR) is not so limited. System and ground parameters that affect the radar signal return are discussed. Two of these, dielectric constant and surface roughness, are the most important with respect to the final radar image. Although SLAR has been used for surveillance of sea ice in the higher latitudes, its usefulness for the study of freshwater lake ice in the mid-latitudes is only now being intensively stu-died. Two images of X-Band (3 cm) radar are presented, together with some comments concerning future developments of radar imagery of lake ice. (See also W75-00809) (Knapp-USGS) W75-00913

DOWN-HOLE EH-PH PROBE AND WATER

Commonwealth Scientific and Industrial Research Organization, Floreat Park (Australia). Div. of Mineralogy.

CSIRO Division of Mineralogy Report No FP.5. August 1974. 14 p, 7 fig, 1 tab, 7 ref.

Descriptors: *Groundwater, *Instrumentation, *Subsurface investigations, *Water sampling, *Oxidation-reduction potential, *Hydrogen ion concentration, Water analysis, Chemical analysis, Geochemistry, Boreholes, On-site tests, Explora-

Two instruments are described for use in analyzing groundwater from below the water table in conditions free of pump or tank contamination and not subject to changes in dissolved gas concentrations with pumping. A probe for direct in situ measurement of redox potential and pH in exploration drill holes uses a combination pH-calomel reference electrode and a single bright platinum electrode in a nylon plunger clamped to a length of shielded cable terminating at the upper end in a two-way switch and a conventional pH meter plug. A down-hole water sampler uses a glass test-tube sample bottle into which a nylon reducing socket and stopper are inserted, inside a weighted aluminum casing. The sample bottle is sealed before being returned to the surface. The instruments have the capability for use to moderate depths (approximately 30 m) below the water table. (CSIRO) W75-01016

APPARATUS FOR CONVERTING THE ENER-

GY OF OCEAN WAVES, Laitram Corp., New Orleans, La.

J. M. Lapeyre.

U.S. Patent No 3,818,704, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1286, June 25, 1974.

Descriptors: *Patents, *Waves(Water), Equipment, Gravity waves, Ocean waves.

Identifiers: *Wave energy, *Power sources, *Energy sources.

The apparatus for converting the energy of surface waves in a liquid such as an ocean, comprises a buoyant helical member mounted for rotation about an axis. The pitch of the helical member approximates the length of the expected waves and the member is floated on the surface with its axis oriented so that each wave traverses the helix lengthwise and buoyantly supports successive sections thereof causing it to rotate about its axis. The helix is coupled with rotary driven means such as an electrical generator. The wave converter is responsive to both the horizontal motion of the waves as well as the vertical motion of the water itself so that rotation and energy output are both continuous and substantially constant even though waves arrive at intervals. (Sinha-OEIS) W75-01050

PRESSURESENSING ULTRASONIC TRANSMITTER FOR TRACKING AQUATIC AQUATIC MITTER FOR ANIMALS,

New Brunswick Univ., Fredericton. Dept. of Electrical Engineering.
D. Luke, D. G. Pincock, and A. B. Stasko.

J Fish Res Board Can. Vol 30, No 9, p 1402-1404.

Identifiers: Aquatic animals, Coding, *Tracking techniques, *Transmitters(Ultrasonic), Remote techniques, *Transmitte sensing, *Depth sensing.

A small transmitter (7 x 1.6 cm) for telemetering swimming depth of aquatic animals was developed. The transmitter operates for 3 days with a signal range of about 1 km in sea water. It codes depth to 40 m or more as changes in pulse repetition rates, detectable by standard ultrasonic receivers .-- Copyright 1974, Biological Abstracts, Inc. W75-01056

7C. Evaluation, Processing and Publication

HYDROGEOLOGY OF WETLANDS IN MAS-SACHUSETTS, Massachusetts Univ., Amherst, Dept. of Geology

and Geography.
For primary bibliographic entry see Field 2F.
W75-00553

DEVELOPMENT OF A FLOOD AND POLLU-TION CONTROL PLAN FOR THE CHICAGO-LAND AREA, COMPUTER SIMULATION PRO-

Chicago Dept. of Public Works, Ill. Bureau of Engineering. For primary bibliographic entry see Field 5B.

W75-00561

SUMMARY OF PLANS FOR ACQUISITION OF WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1975.

Geological Survey, Reston, Va. Office of Water Data Coordination. For primary bibliographic entry see Field 7A. W75-00617

SELECTED WATER-LEVEL RECORDS FOR

COLORADO, 1970-74, Geological Survey, Lakewood, Colo.
T.J. Major, L. Kerbs, and R. D. Penley.
Colorado Water Conservation Board, Denver, Colorado Water Resources Basic-Data Release No 34, 1974. 104 p, 2 fig, 2 tab.

Descriptors: *Water levels, *Groundwater, *Basic data collections, *Colorado, *Hydrologic data, Irrigation water, Water wells.

Water-levels were measured in wells in Colorado prior to the irrigation season in 1974. Measurements made during the 4 preceding years are included to serve as references illustrating declining or rising water levels. These data can provide a means of estimating changes in the quantity of the water stored. Comparison of annual water levels will indicate the annual effect of recharge and discharge. Measurements are taken prior to the irrigation season to achieve the most natural representation of the aquifer. (Knapp-USGS) W75-00619

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1972,

Geological Survey, Austin, Tex. R. D. Steger.

Open-file report, May 1974. 102 p, 1 fig, 4 tab, 3

Descriptors: *Basic data collection. *Urbanization, *Urban hydrology, *Texas, Runoff, Recharge, Streamflow, Hydrologic data, Water quality. Identifiers: *San Antonio(Tex).

Data were collected to show the effects of various stages of urbanization on flood discharge and ru-noff in San Antonio, Texas. Factors considered are time, variation in rainfall patterns and intensity, and size of the drainage area. Total precipita-tion and rainfall intensities were determined from 19 recording rain gages distributed throughout the study area. Runoff data from the San Antonio urban study area are based on discharg measurements and stage records at six continuous-record stream-gaging stations, seven crest-stage partial-record stations (flood hydrographs obtained), and water-surface elevations at four flood-profile par-tial-record stations. Daily discharge records are given for the six continuous-record stations. Annual maximum discharge records were collected in

the seven crest-stage partial-record stations. (Knapp-USGS) W75-00620

WATER RESOURCES OF THE ST. LOUIS AREA, MISSOURI, Missouri Geological Survey and Water Resources,

For primary bibliographic entry see Field 4B. W75-00621 Rolla.

DIGITAL COMPUTER SIMULATION OF THERMAL EFFLUENT DISPERSION IN RIVERS, LAKES, AND ESTUARIES, Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Alabama. For primary bibliographic entry see Field 5B. W75-00622

GROUND-WATER LEVELS IN NEW MEXICO, 1970, AND CHANGES IN WATER LEVELS, 1966-70,

Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 4B. W75-00624

WATER RESOURCES DATA FOR COLORADO, 1973: PART 2-WATER QUALITY RECORDS. Geological Survey, Lakewood, Colo. Data Rept, 1974. 120 p, 1 fig, 5 tab, 29 ref.

Descriptors: *Basic data collections. *Colorado. *Water quality, Water chemistry, Sampling, Hydrologic data, Surface waters, Solutes, Hardness(Water), Sodium, Hydrogen ion concentration. Sediments.

Water quality data for surface waters in Colorado for the 1973 water year are presented. Data for a few water-quality stations in bordering States are also included. The water quality information includes chemical quality, fluvial sediment, and water temperatures. The chemical quality includes concentrations of individual dissolved constitutents and certain properties or characteristics such as hardness, sodium absorption ratio, specific conductance, and pH. Fluvial sediment information is given for suspended-sediment discharges and concentrations and for particle size distribution of suspended sediment and bed material. Water temperature data represent once-daily observations except for stations where a continuous temperature recorder furnishes information from which daily minimums and maximums are obtained. (Knapp-USGS) W75-00625

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE-SUMMARY OF NINTH MEETING, MAY 21-23, 1974, SIOUX FALLS, SOUTH DAKOTA. Geological Survey, Reston, Va. Office of Water

Data Coordination.
For primary bibliographic entry see Field 7A.
W75-00626

REPORT, **PROGRESS** COOPERATIVE HIGHWAY PROGRAM FOR YEAR ENDING JUNE 30, 1974,

Geological Survey, Little Rock, Ark. For primary bibliographic entry see Field 8B. W75-00627

WORTH OF ADDITIONAL DATA TO A DIGITAL COMPUTER MODEL OF A GROUND-WATER BASIN.

Geological Survey, El Paso, Tex. For primary bibliographic entry see Field 2F. W75-00630

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

AN INDEX TO SPRINGS OF FLORIDA, Geological Survey, Tallahassee, Fla. J. C. Rosenau, and G. L. Faulkner. Florida Bureau of Geology, Tallahassee, Map Series No 63, 1974. 1 sheet, 1 map, 2 tab.

Descriptors: *Springs, *Florida, Hydrogeology, *Maps, Karst hydrology, Data collections.

Florida's springs represent natural overflow from the State's vast groundwater storage and circulation system. Their combined flow is about 8,000 cubic feet per second or about 5 billion gallons a day. The total number of springs in Florida is not known, but there are more than 200. The springs of Florida are used to a limited degree as a source of water supply by agriculture and industry; however, their primary use is for recreation. This map report is an index to the location and magnitude of flow of 165 of the better known natural springs and 7 pseudo-springs in Florida. Pseudo-springs flow from artesian wells that are more than a thousand feet deep. (Knapp-USGS)

LOW STREAMFLOW IN FLORIDA--MAG-NITUDE AND FREQUENCY, Geological Survey, Tallahassee, Fla. R. B. Stone. Florida Bureau of Geology, Tallahassee, Map Series No 64, 1974. 1 sheet, 5 fig, 1 map, 9 ref.

Descriptors: *Low flow, *Florida, Rainfall-runoff relationships, Base flow, Hydrogeology, Frequency analysis, *Maps.

Low flow in Florida streams is sometimes not sufficient to supply the water required for municipal or industrial supplies, supplemental irrigation, maintenance of suitable conditions for fish, and disposal of liquid wastes. Low-flow characteristics of a stream indicate groundwater flow to a stream and can be used as parameters in regional water-resource evaluation, or as legal hydrologic parameters for pollution control. The range of minumum flow to be expected in the state if shown on a map. Frequency curves for selected streams were prepared from annual minimum flows. These annual minumum flows are minimum average flows for periods of 1, 3, 7, 14, 30, 60, 90, 120, 150, 183, and 274 consecutive days. Flat-sloped low-flow frequency curves suggest that the sufficial materials in the stream basin are highly permeable; much of the rainfall is absorbed where it falls and is stored in aquifers which have sufficient capacity to sustain a high level of base flow during dry weather. Steeper sloped curves, such as shown for bc St. Johns River, suggest less permeable basin materials, and less water available to sustain streamflow during dry weather. (Knapp-USGS) W75-00633

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN EAST CENTRAL FLORIDA, MAY 1974,

Geological Survey, Winter Park, Fla. C. P. Laughlin. Geological Survey open-file report FL-74025, 1974. I sheet, I map.

Descriptors: "Water levels, "Florida, "Artesian aquifers, "Potentiometric level, Groundwater, Water table, Hydrologic data," Maps. Identifiers: "Floridan aquifer.

A map shows the potentiometric surface of the Floridan aquifer in east-central Florida as of May 1974. The contour interval on the potentiometric surface is 5 feet. (Knapp-USGS) W75-00635

PROCEEDINGS OF NAVAL ENVIRONMENTAL PROTECTION DATA BASE, INSTRUMENTATION WORKSHOP. For primary bibliographic entry see Field 5A. W75-00644

NAVY ENVIRONMENTAL QUALITY GUIDES FOR OFFSHORE AREAS,

Naval Oceanographic Office, Washington, D.C. For primary bibliographic entry see Field 5G. W75-00648

TESTING OF WATER QUALITY INSTRUMENTATION AT NOIC,
National Oceanographic Instrumentation Center,

National Oceanographic Instrumentation Center Rockville, Md. For primary bibliographic entry see Field 5A. W75-00652

A SYSTEM FOR AUTOMATIC DATA ACQUISITION

Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5A.
W75-0063

WATER POLLUTION, SHIPS' WASTE-WATERS, WATER QUALITY MEASUREMENT, Naval Ship Research and Development Center, Annapolis, Md. For primary bibliographic entry see Field 5B. W75-0065

FORECASTING WATER DEMAND IN WYOM-ING WITH THE MAIN II SYSTEM, Wyoming Univ., Laramie. Water Resources Research Inst. For primary bibliographic entry see Field 6D. W75-00700

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CON-STRAINTS - PHASE I, Nevada Univ., Reno. Center for Water Resources

Research.
For primary bibliographic entry see Field 5G.
W75-00701

SUPPORT IN THE OVERALL DESIGN DEVELOPMENT OF A NATIONAL WATER EXCHANGE (NAWDEX): FINAL (JANUARY-DECEMBER 1973), PRC Systems Sciences Co., McLean, Va. For primary bibliographic entry see Field 7A. W75-00708

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR ARMY MILITARY PROGRAMS, Army Construction Engineering Research Lab., Champaign, Ill. For primary bibliographic entry see Field 6G. W75-00735

TESTS OF A GROUNDWATER OPTIMIZATION TECHNIQUE, Stanford Univ., Calif. Dept. of Geology. For primary bibliographic entry see Field 4B. W75-00746

GROUND-WATER MODELLING USING IN-TERACTIVE ANALOGUE AND DIGITAL COM-PUTERS, Birmingham Univ. (England). Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 2F.
W75-00747

THE EFFECT OF SLOPE, EXPOSURE AND MOUNTAIN SCREENING ON THE SOLAR RADIATION OF MCCALL GLACIER, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE, Alaska liny. College Geophysical Inst.

Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-00777 A DATA ACQUISITION SYSTEM FOR TRANSIENT POROUS MEDIA EXPERIMENTS IN A SECTOR TANK, California Univ., Davis. Dept. of Water Science and Engineering.

and Engineering.
For primary bibliographic entry see Field 4B.
W75-00782

GROUND WATER COMPUTATIONS IN NEW JERSEY, U.S.A., Columbia Univ., New York. For primary bibliographic entry see Field 2A. W75-00784

THE COMBINED HEAT, ICE AND WATER BALANCE OF MCCALL GLACIER, ALASKA: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-00790

THE MAP ABSTRACT OF WATER RESOURCES: ALABAMA, Geological Survey, University, Ala. N. G. Lineback, L. B. Peirce, and N. E. Turnage. Map Abstract No 2, 1974. 105 p, 108 fig, 14 ref.

Descriptors: *Water resources, *Water quality, *Alabama, *Groundwater resources, Surface waters, Precipitation(Atmospheric), Rainfall, Climatic data, Evaporation, Runoff, Physiographic provinces, River basins, Areal, Maps, Water supply.

Water resources data for Alabama were presented in generalized a real form for the entire state. Maps delineating counties, population distribution, physiographic provinces, and river basins were presented. Other maps indicated the variability of temperature, precipitation, lake evaporation, runoff, low flow, and areal distributions of groundwater availability and major aquifers. Areal patterns of water use from ground and surface water sources for public water supplies, agriculture, industry, cooling water, and of the variation in physical and chemical characteristics of ground and surface waters were presented. (Humphreys-ISWS)

GROUNDWATER IN THE ALLUVIUM ALONG THE GREEN RIVER BETWEEN ITS MOUTH AND WOODBURY, KENTUCKY, Geological Survey, Louisville, Ky.

P. D. Ryder. Water Resources Investigations 53-73, 1974. 5 p, 13 fig, 1 map, 1 tab, 22 ref.

Descriptors: *Groundwater, *Alluvium, *Kentucky, *Surface-groundwater relationships, Alluvial channels, Hydrogeology, Induced infiltration, *Maps, Hydrologic data, Mathematical models, Water yield. Identifiers: *Green River(Ky).

Groundwater resources were studied in the Green River flood plain in the Western Coal Field region of Kentucky. The purpose is to describe the geologic, hydrologic, and water-quality characteristics of the alluvial aquifer, and to analyze aquifer response to pumping. The largest source of recharge to the alluvium is the Green River. Induced infiltration of river water may occur when the water level in the aquifer falls below stage in response to groundwater pumpage. A relatively inexpensive method for determining the diffusivity, the ratio of the transmissivity to the storage coefficient (T/S), is the Flood Wave Response Model. These parameters, together with streambed thickness and hydraulic conductivity, water-level elevations in the streams, and location of bedrock valley walls, were used in an iterative digital model. A series of maps show contours of water-

level drawdowns generated in response to simulated pumping from the alluvial aquifer. A table shows chemical analyses of water from seven wells in the alluvium. The water is predominantly a calcium magnesium sodium bicarbonate type. All of the water sampled from the alluvium has a very high iron content. Hardness values are very high. For most uses, including domestic supplies, treatment to soften the water would be desirable. Bar diagrams on the map show the areal distribution and the chemical constituents of the samples. (Knapp-USGS) W75-00806

THE ROLE OF SNOW AND ICE IN HYDROLO-

For primary bibliographic entry see Field 2C.

DEVELOPMENT AND USE OF MOUNTAIN PRECIPITATION MAP, Soil Conservation Service, Bozeman, Mont.

P. E. Farnes.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 64-75, 1973. 7

Descriptors: *Snow surveys, *Water yield, *Runoff forecasting, Precipitation(Atmospheric), Isohyets, Mapping, Maps, *Rocky Mountain Region, Snow cover, Mountain forests, Precipitation

A correlation exists between water equivalent of an average winter snowpack and average annual precipitation in the Rock Mountain areas. For snow courses located in timbered areas the amount of snowfall in an open meadow situation may be determined by adjusting snow-course readings for the forest canopy cover at the sam-pling points on the snow course. This open dow or natural snowfall value for average April 1 snow water equivalent is compared to average annual precipitation at locations where both values are available. From this relationship, average annual precipitation is estimated for all snow course sites. Using estimated and actual precipitation data and elevation, isohyets are drawn. The hydrology of various drainages is eval-uated by determining the average annual precipitation for gaged drainage basins and comparing this to average runoff. By using these relationships the runoff for ungaged basins can be estimated by determining the average annual basin precipita-tion. (See also W75-00809) (Knapp-USGS)

ICE FORMATION IN A SMALL ALASKAN

STREAM, Alaska Univ., College. For primary bibliographic entry see Field 2C. W75-00844

MAPPING OF SNOWFALL AND SNOW COVER IN NORTH AMERICA, Atmospheric Environment Service, Toronto

Atmospheric Contario).

G. A. McKay, and H. A. Thompson.

In: The Role of Snow and Ice in Hydrology;

Preceedings of Banff Symposium, September

1972: International Association of Hydrological Sciences Publication 107, Vol 1, p598-609, 1973. 2 fig, 31 ref.

Descriptors: *Snow surveys, *Snow cover, *Mapping, *Snowfall, *Water yield, Sampling, Streamflow forecasting, Runoff forecasting, Precipitation gages, Water balance, Data collections, Hydrologic data, *North America.

Maps of snow resources are finding greatly in-creased application. Biases resulting from the

measuring instruments and sampling methods necessitate large adjustments in the preparation of water balance maps. Because of the natural variability of snowfall and snow cover the interpreta-tion for point to area/values remains a major problem for the cartographer. The use of zonation and height-dependency curves is recommended to improve the quality of maps. Also recommended are water and energy balance techniques and, where possible, the use of computer mapping procedures. Improved data and better topographical relationships are required for most regions in order to achieve the precision needed by map users. (See also W75-00809) (Knapp-USGS) W75-00853

ROLE OF SNOW AND ICE HYDROLOGY IN INDIA.

Hydraulic Research Station, Jammu (India). For primary bibliographic entry see Field 2C. W75-00854

MESOSCALE MEASUREMENT OF SNOW-COVER PROPERTIES, Cold Regions Research and Engineering Lab.,

Hanover, N.H.

Hanover, N.H.
M. A. Bilello, R. E. Bates, and J. Riley.
In: The Role of Snow and Ice in Hydrology;
Proceedings of Banff Symposium, September
1972: International Association of Hydrological
Sciences Publication 107, Vol 1, p 624-643, 1973.

Descriptors: *Snowpacks, *Snow cover, *Water equivalent, Density, Temperature, *Alaska, Weather, Meteorology, Forests.

13 fig, 1 tab, 16 ref.

Physical characteristics of the snow cover and associated meteorological conditions were observed at 19 sites at Fort Greely, Alaska, during the winter of 1966-67. Snowfall totaled 245 cm and maximum snow depths were 80 to 100 cm. Measurements at nine sites showed the snow density to be light; for example, the average density in the forest was less than 0.24 g/cc. At Jarvis Creek, the density averaged 0.33 g/cc. The snow in the forest was colder than that at exposed sites. Associations between snow-cover properties and weather were tested. When the average air temperature in the forest was -10 deg C the snow temperature 10 cm Torest was -10 deg C the snow temperature 10 cm below the surface was about -7 deg C; when the air temperature was -30 deg C the snow at 10-cm depth was about -19 deg C. In contrast, when the air temperature was -30 deg C the snow temperature near the ground was about -10 deg C. (See also W75-00809) (Knapp-USGS)

COLLECTION OF ATMOSPHERIC DATA FOR PROJECT SKYWATER, Soil Conservation Service, Denver, Colo.

For primary bibliographic entry see Field 3B. W75-00856

AREAL AVERAGING OF SNOW COVER CHARACTERISTICS, Hydrometeorological Service of the USSR,

Moscow.

E. P. Chemerenko In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 1, p 656-663, 1973. 2 fig, 2 tab, 3 ref.

Descriptors: *Data collections, *Snow cover, *Statistics, Snow surveys, Precipitation gages, Hydrologic data, Meteorological data.

The problem of accuracy in the areal averaging of snow cover characteristics is discussed. The error in the areal averaging is computed using the theory of random functions. The effect of both the number and distribution of observing stations on the accuracy of averaging is shown by means of numerical examples. Uniform distribution of stations over an area is desirable. If there is a need for the establishment of a new station the problem of its location should be given consideration, so that its addition to the existing network would result in the greatest possible decrease in error. (See also W75-00809) (Knapp-USGS) W75-00857

A GRAPHICAL AND STATISTICAL AP-PROACH TO THE REGIONAL STUDY OF SNOWPACK IN MOUNTAIN AREAS, WITH SPECIAL REFERENCE TO COLORADO AND NEW MEXICO, Vrije Universiteit, Amsterdam (Netherlands).

Inst. of Earth Sciences.

G. B. Engelen.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 885-894, 1973. 3 fig. 14 ref.

Descriptors: *Snowpacks, *Snowmelt. Descriptors: "Snowpacks, "Snowmen, "Mountains, "Statistics, Statistical methods, "Colorado, "New Mexico, Snow surveys, Ablation, Snow cover, Mapping.

Snow regime types were defined from basic snow survey measurements by a combination of statisti-cal and graphical methods. The regimes are portrayed by snowgraphs, dealing with depth and water equivalent and their variabilities, and with the depth/water content ratio. Snowcourse measurements from Colorado and New Mexico show that the regimes are basically composed of a snow accumulation regime with a normal probability distribution and an ablation/melt regime with a normal probability distribution. The actually observed frequency distributions of snowpack values result from the combined effect of both regimes, which are overlapping in time and mutually counteracting. (See also W75-00809) (Knapp-USGS) W75-00875

EVALUATION OF AIR PHOTOS FOR SNOW-

MELT-RUNOFF FORECASTS, Swiss Federal Inst. for Snow and Avalanche Research, Davos, Weissfluhjoch. J. Martinec.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 915-926, 1973. 8 fig. 2 tab. 3 ref.

Descriptors: *Snow cover, *Aerial photography, *Runoff forecasting, Ablation, Snowmelt, Streamflow forecasting, Mapping, Alpine.
Identifiers: *Switzerland(Dischma watershed).

Measuring the areal extent of snow cover in a watershed for snowmelt-runoff computations is useful in forecasting runoff. In mountain areas snow cover is reduced in the process of ablation to snow cover is reduced in the process of ablation to scattered patches thus making the assessment of the snow coverage difficult. Evaluation of periodic air photos by an image-analyzing computer presents a relatively simple solution to this problem. Snow cover depletion curves thus ob-tained for the Dischma watershed in Switzerland are studied in relation to the area-elevation curve and to the frequency distribution of snow depths. Snow coverage is indispensable for the assessment of the maximum runoff and for short-term forecasts. (See also W75-00809) (Knapp-USGS) W75-00877

DAILY AND SEASONAL RUNOFF FORECASTING WITH A WATER BUDGET MODEL, British Columbia Univ., Vancouver. Dept. of Civil

Engineering. For primary bibliographic entry see Field 4A. W75-00885

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

COMPUTER SIMULATION TECHNIQUES FOR FORECASTING SNOWMELT RUNOFF, Hydrocomp, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 4A. W75-00889

GLACIER SURVEYS BY THE WATER SURVEY

OF CANADA, Water Survey of Canada, Ottawa (Ontario). I. A. Reid.

In: The Role of Snow and Ice in Hydrology; Proceedings of Banff Symposium, September 1972: International Association of Hydrological Sciences Publication 107, Vol 2, p 1133-1143, 1973. 3 fig. 12 ref.

Descriptors: *Glaciers, *Surveys, *Canada, Mapping, Photogrammetry, Aerial photography, Glaciohydrology, Water balance, *Data collec-tions, Hydrologic data.

Canada began glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques the glacier surveys evolved to the extent that it is now feasible to produce a series of maps from which linear, areal, directional and volumetric changes can be determined. Glacier survey work from its inception in 1945 is reviewed. In addition, the results of two methods for determining the average contribution of a glacier to streamflow are summarized. tion of a gracier to streamfow any surveys reveal that the glaciers, in general, are becoming smaller in size; hence, their regulation effect is diminishing. (S_k a also W75-00809) (Knapp-USGS) W75-00895

A REFINED COMPUTATIONAL ALGORITHM FOR A CLASS OF DYNAMIC PROGRAMMING PROBLEMS WITH APPLICATIONS TO THE SNAKE-COLUMBIA RIVER BASIN. Washington State Univ., Pullman. Dept of Com-

puter Science. For primary bibliographic entry see Field 4A. W75-00967

AN EVALUATION AND APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO AN IDAHO WATERSHED, Idaho Univ., Moscow. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 2A.

SURFACE RUNOFF SIMULATION MODEL, Nebraska Univ., Lincoln. Dept. of Civil Engineer-For primary bibliographic entry see Field 2A. W75-00969

URBAN RUNOFF QUALITY AND MODELING STUDY, Nebraska Univ., Lincoln. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B. W75-00972

MODELS AND METHODS APPLICABLE TO CORPS OF ENGINEERS URBAN STUDIES, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 6A. W75-01001

A METHODOLOGY FOR PLANNING LAND USE AND ENGINEERING ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT: THE FLOOD PLAIN MANAGEMENT SYSTEM MODEL,
Arizona Univ., Tucson.

For primary bibliographic entry see Field 6F. W75-01002

8. ENGINEERING WORKS

8A. Structures

GUIDELINES FOR DESIGNING PLANT SEWERS, Bissell, Merrill and Associates, Williamsville,

N.Y. W. H. Merrill, Jr.

Plant Engineering, Vol 28, No 7, p 95-97, April 4, 1974. 4 fig, 1 tab.

Descriptors: *Design criteria, *Sewers, Sewerage, Estimates, Wastes, Inflow, Flow, Legislation, Public health, Discharge lines, Velocity, Pipes, Pipelines, Pipe flow, Joints(Connections), Manholes, Strength of materials, Corrosion, Corrosion control, Planning. Identifiers: Alignment.

Design criteria for plant sewers are presented. They should be based on information obtained by a formal waste water survey that details probable waste material to be discharged into the sewer and estimates expected flow: maximum surges, minimum flow, and average flow. Sewer ordinances and health codes may establish additional design criteria. A plan should be made of the area and contain a plan and a profile of the project area, both the location and elevation of all structures and underground items near the proposed sewer line, and the point of inlet and point of discharge for the proposed line. Key elements of good sewer design procedures include alignment, velocity, pipe joints, manholes, cross connections, pipe strength, corrosion problems, corrosion control, pipe material, and project plans. (Merritt-FIRL) W75-00710

VOLUME OF STORM WATER RETENTION

BASINS, Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering. For primary W75-00776 bibliographic entry see Field 5D.

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI (SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Kansas City, Mo.
Available from National Technical Information
Service, U.S. Dept. of Commerce, Springfield,
Va. 22161, as EIS-MO-73-1538-F, \$13.75 in paper
copy, \$2.25 in microfiche. September 24, 1973. 232
p, 4 graph, 3 photo, 12 tab.

Descriptors: *Environmental effects, *Dam construction, *Reservoir construction, *Project planning, *Missouri, Dams, Water manage-ment(Applied), Rivers, Water resources development, Planning, Financial feasibility, Economic feasibility, Project feasibility, Engineering struc-tures, Water law, Administrative decisions, Federal government, Administration, Governmen-tal interrelations, Alternative planning.

Identifiers: *Environmental Impact Statements, Dam effects, Injunctive relief, Declaratory judgments, *Osage River(Mo).

This supplement to the final environmental statement for this project is provided to clarify and amplify points of concern raised subsequent to issuance of the final statement. In addition to covering current items related to project planning, it treats subjects raised in present litigation by the Environmental Defense Fund, et al. In that action the plaintiffs were seeking a declaration of procedural inadequacy of the final statement, the invalidity of the decision based on that statement, and further injunctive relief. Items covered also include: discussion of the General Accounting Of-fice report dated 24 January 1973 related to hydropower economics; response to a letter dated 19 July 1973 from the Missouri Department of Conservation commenting on the final statement; an updated benefit-cost analysis summary for the authorized project; additional material relating to alternatives; and updated information on paddle-fish, naiades, and the Rodger's Shelter Archeolog-ical site. (Deckert-Florida) W75-00929

KNIFE LAKE IMPROVEMENT RC AND D MEASURE ONANEGOZIE RC AND D PRO-JECT, KANABEC COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATE-

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 4A. W75-00930

ENVIRONMENTAL DEFENSE FUND, INC. V. ARMSTRONG (INJUNCTION ACTION AGAINST CONSTRUCTION OF A DAM). For primary bibliographic entry see Field 6E. W75-00955

EXPERIENCES IN THE CONSTRUCTION AND OPERATION OF DAMS IN SALINE ENVIRON-

Western Mining Corp. Ltd., Perth (Australia). M E Barnes

ANCOLD (Australian National Committee on Large Dams) Bulletin No 40, p 13-22, September 1974. 2 fig. 3 tab, 3 ref.

Descriptors: *Arid lands, *Reservoir construction, *Reservoir operation, *Salinity, Saline soils, Saline lakes, Dams, Reservoirs, Water quality, Evaporation, Reservoir evaporation, Reservoir design, *Australia. Identifiers: *Kambalda(W.A.).

The Kambalda area of Western Australia is situated near a large salt lake in a region of arid non-seasonal climate. High evaporation has resulted in the concentration of cyclic salts to the extent that the water in the sediments of the lake and con-nected aquifers has in the order of 370000ppm total dissolved salts. This salinity is reflected in soil and rock material used for dam construction and in storage basins. Runoff in the region, however, is generally of low salinity, due to overland flow associated with low permeability of the soil mantle and an absence of underground flow to streams. The construction of two small dams and a service reservoir in the areas is described; and salinity levels during early operation of the dams are recorded and discussed. An increase in salinity is attributed to leaching of salts from soils within the reservoir basin and to a concentration by evaporation. Recommendations are given for the construction and operation of dams in such areas so as to minimize the salinity of stored water. (CSIRO) W75-01015

8B. Hydraulics

LAKE HYDRODYNAMICS, Wisconsin Univ., Milwaukee. Center for Great For primary bibliographic entry see Field 2H. W75-00565 Lakes Studies.

PROGRESS REPORT, COOPERATIVE HIGHWAY PROGRAM FOR YEAR ENDING JUNE 30, 1974, Geological Survey, Little Rock, Ark. Open-file report, September 1974. 22 p, 1 fig, 1

ENGINEERING WORKS—Field 8 Fisheries Engineering—Group 81

Descriptors: *Data collections, *Hydrologic data, *Arkansas, *Design flood, Design flow, Stream gages, Peak discharge, Bridges, Culverts, Bridge design.

For economic design of bridges and culverts in Arkansas the magnitude and frequency of flood were calculated for all size drainage basins. Hydrologic and hydraulic characteristics were analyzed at specific bridge sites where unusual circumstances exist. The data-collection network includes 108 crest-stage stations and 26 dual-digital stations. (Knapp-USGS) W75-00627

FLOATING SIPHON WITH A CONSTANT

Aarhus Univ. (Denmark). Lab. of Geophysics. For primary bibliographic entry see Field 8C. W75-00749

INSULATION AGAINST ICE AT MEASURING

WEIRS, Norges Tekniske Hoegskole, Trondheim Div. of Hydraulic Engineering.
For primary bibliographic entry see Field 2C.
W75-00750

PEAK DISTRIBUTION OF RANDOM WAVE-

CURRENT FORCE, North Carolina State Univ. Raleigh. Dept. of Civil

Engineering.
C. C. Tung.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 100, No EM5, Proceedings Paper 10843, p 873-884, October 1974. 5 fig, 7 ref, 2 append.

Descriptors: *Waves(Water), *Currents(Water), Structural analysis, Distribution, Flow, Stochastic processes, Structural stability, Coastal engineer-ing, Loads(Forces), Peak loads, Load distribution, Fluid mechanics, Hydraulics, Structural fatigue. Identifiers: Peak forces, Wave-current interaction.

Evaluation of fatigue in marine structures requires knowledge of the peak distribution of fluid forces. Wind generated waves undergo a change in characteristics when a current is encountered. The influence of wave-current interactions on the peak distribution of fluid force was examined for an element of a cylinder in a random, Gaussian, zero mean, stationary deep-water gravity wave field combined with a steady current. Results were presented for waves generated by a 40 mph wind without current and with concurrent and adverse current with a velocity of 3 fps. Wave-current interactions were shown to significantly change the peak distribution of fluid force, especially for adverse currents. Assumption of Guassian peak distribution of fluid force was shown to give unsatisfactory results. (Adams-ISWS) W75-00757

THE LOCAL DISTRIBUTION OF STRESS NEAR A POINT OF ZERO SHEAR STRESS IN A RECTILINEAR FLOW FIELD,

Washington Univ., Seattle. Geophysics Program. C. F. Raymond.

Journal of Glaciology, Vol 13, No 67, p 141-143,

1974 1 ref

Descriptors: *Mathematical studies, *Glaciers, *Ice, *Shear stress, Analytical techniques, Mathematics, Equations, Non-Newtonian flow, Distribution patterns, Limiting factors, Stress analysis, Channels, Pipes.

The distribution of stress in the vicinity of a point at which shear stress magnitude is zero was inat which sheat stress magnitude is 200 was investigated analytically for rectilinear flow of a fluid in a channel or pipe. For a fluid with non-linear power-law properties the contours of constant stress and velocity approach either circular or flat shapes near such a point, irrespective of the particular boundary conditions. There are no intermediate cases, although such intermediate behavior exists for linear fluids. (Humphreys-ISWS) W75-00774

VOLUME OF STORM WATER RETENTION

BASINS, Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D. W75-00776

A DATA ACQUISITION SYSTEM FOR TRANSIENT POROUS MEDIA EXPERIMENTS

IN A SECTOR TANK, California Univ., Davis. Dept. of Water Science For primary bibliographic entry see Field 4B. W75-00782

8C. Hydraulic Machinery

FLUID FILTERING DEVICE, Parker-Hannifin Corp., Cleveland, Ohio. For primary bibliographic entry see Field 5D. W75-00604

APPARATUS FOR DISINTEGRATING AND SEPARATING MATERIAL IN FLUID SUSPEN-

Improved Machinery, Inc., Nashua, N.H. For primary bibliographic entry see Field 5G. W75-00609

FLOATING SIPHON WITH A CONSTANT HEAD, Aarhus Univ. (Denmark). Lab. of Geophysics.

R. Thomsen. Nordic Hydrology, Vol 5, No 2, p 98-107, 1974. 5 fig. 1 tab. 2 ref.

Descriptors: *Siphons, *Floating, Fluid mechanics, Hydraulic design, Hydraulic models, Calibrations, Discharge measurement, Calibration Discharge(Water), *Storage tanks, Hydraulics.

A floating siphon made up of concentric tubes was proposed as a reliable and inexpensive device to discharge water from a reservoir tank at a constant rate independent of the water level in the tank, provided the siphon is discharged freely into the atmosphere. By adjusting the opening area in the outlet tube continuously, any constant discharge can be obtained. With simple aids the siphon was calibrated to work with an accuracy better than 5%. By means of an electric Water Surface Registration System it was proved that the variation in discharge is better than 1% at a discharge of 0.3-2.4 liters/sec. (Terstriep-ISWS) w75-00749

MODULARIZED SEA POWER ELECTRICAL GENERATOR PLANT, Carnegie-Mellon Univ., Pittsburgh, Pa. (assignee)

Callegge-National Callegge Action 1985, 22 fig. 3 ref; Official Gazette of the United States Patent Office, Vol 921, No 4, p 1368, April 23, 1974.

Descriptors: *Patents, Electricity, *Power plants, *Water utilization, *Thermocline, Equipment.
Identifiers: Power sources, Potential energy, *Energy sources, Electric power.

An electrical generating plant is disclosed which utilizes temperature differentials (thermoclines) between various levels of the ocean. The power unit is formed by modularized boiler units, con-denser units and engine units which are adapted

for assembly in a stacked array. Any number of power units can be efficiently and economically connected together and attached to a pair of prefabricated pipes to form a generating plant. (Sinha-OEIS)

8D. Soil Mechanics

ROCK SAUSAGE FALL VELOCITY MEASURE-MENTS.

Connecticut University, Storrs.

H-K. Soong. Available from the National Technical Informa-

tion Service, Springfield, Va. 22161 as PB-237 243, \$3.25 in paper copy, \$2.25 in microfiche. M Sc Thesis, 1972. 13 p, 1 fig, 2 tab, 10 ref, append. OWRT A-035-CONN(2). 14-31-0001-3207.

Descriptors: *Settling velocity, *Flow resistance, *Rocks, Hydraulic models, Laboratory tests, Hydrodynamics, Velocity, Particle shape, Particle size, Turbulent flow, Laminar flow, Drag, Hydraulics.
Identifiers: *Rock sausages, *Cement mortar cylinders, Steel spheres, Glass spheres.

Terminal velocities of rock sausages, cement mortar cylinders, rocks, and steel and glass spheres falling freely with turbulent wakes in water were measured experimentally in a vertical 8-inch diameter pipe 14 ft long. Free fall time of each object was measured for six distances with a stopwatch. Fall velocity was determined from the slope of a straight line drawn through a distancetime plot of the data. Except for one test, the fall velocities for rock sausages were smaller than those for cement mortar cylinders and rocks. It was concluded that the tests were too limited for a statistical study of the results. For future tests a larger pipe should be used to minimize the effect of the pipe wall on test results. (Humphreys-ISWS) W75-00551

8G. Materials

ROCK SAUSAGE FALL VELOCITY MEASURE-MENTS.

Connecticut University, Storrs. For primary bibliographic entry see Field 8D. W75-00551

81. Fisheries Engineering

TOXICITY OF MIXTURES OF QUINALDINE Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. V. K. Dawson, and L. L. Marking. Report No 53, 1973. 11 p, 7 tab, 23 ref.

*Fish, *Fish control agents, Descriptors: *Toxicity, Water temperature, Hardness (Water), Hydrogen ion concentration, Salmonids, Carp, Lethal limit, Channel catfish, Bass, Sunfishes, Identifiers: *Anesthetics, Ouinaldine sulfate, MS-

Mixtures of fish anesthetics, quinaldine sulfate and MS-222, were tested to define concentrations of three ratios of the combination which are toxic to various species and sizes of freshwater fish at selected exposure periods in water at three tem-peratures, four water hardnesses, and four pH's peratures, four water naronesses, and four ph s and to determine safety for use pattern concentra-tions and exposures. Static toxicity tests of mix-tures of quinaldine sulfate and MS-222 were con-ducted with 3- to 6-cm fish. Ninety-six hour LC50's for the 1-4 ratio of quinaldine sulfate: MS-222 among nine species of fish ranged from 4.23:16.9 mg/l for lake trout to 8.63:34.5 mg/l for

Field 8-ENGINEERING WORKS

Group 81—Fisheries Engineering

carp in soft reconstituted water at 12C. The toxic effect of the combination is greater than additive as indicated by an average additive index of 0.26. The toxicity of the drugs to fingerling rainbow trout was not influenced by temperature changes and the combined anesthetics are slightly less toxic in solutions adjusted to pH 9.5. The mixture is less toxic in very soft water than in harder water, but the decreased pH in very soft water is considered responsible for reduced activity. (Jones-Wisconsin) W75-00562

THE EFFICACY OF QUINALDINE SULFATE:MS-222 MIXTURES FOR THE ANESTHETIZATION OF FRESHWATER FISH, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
P. A. Gilderhus, B. L. Berger, J. B. Sills, and P. D. Harman.
Report No 54, 1973. 5 p, 6 tab, 9 ref.

Descriptors: *Freshwater fish, *Fish control agents, Salmonids, Hydrogen ion concentration, Hardness(Water), Water temperature, Channel catfish, Mortality, Water chemistry.
Identifiers: *Anesthetics, Quinaldine sulfate, MS-222

Combinations of quinaldine sulfate and MS-222 were tested for their efficacy in anesthetizing 14 species of freshwater fish. The combinations possess the attributes of both anesthetics—that is, the long safe holding time with quinaldine sulfate and the rapid anesthetization with MS-222. Combining the anesthetics greatly reduces the concentrations than those necessary when they are used alone. Higher concentrations of the combination are generally needed for large adult fish than for small, immature fish. Most salmonids tested required concentrations of 10:20 to 10:40 mg/l (quinaldine sulfate:MS-222) for effective anesthetization. Warmwater species generally required higher concentrations of 10:40 to 20:75 mg/l. The combination is relatively ineffective when it lowers the pH of the water to 6 or below which is more prone to occur in soft or unbuffered water. If the combined anesthetics lower the pH of the solution to near 6 or below, the pH should be raised to 6.5 or higher with sodium bicarbonate or another satisfactory buffer. (Jones-Wisconsin) W75-00:63

RESIDUES OF QUINALDINE AND MS-222 IN FISH FOLLOWING ANESTHESIA WITH MIXTURES OF QUINALDINE SULFATE:MS-222, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
J. B. Sills, J. L. Allen, P. D. Harman, and C. W. Luhning.
Report No 55, 1973. 5 p. 6 tab, 15 ref.

Descriptors: *Fish control agents, *Persistence, Fish physiology, Channel catfish, Salmonids. Identifiers: *Anesthetics, Residues, Quinaldine, Quinaldine sulfate, MS-222.

The concentration and persistence of quinaldine and MS-222 residues in coldwater and warmwater fish species following anesthesia with efficacious concentrations of the mixture were measured using gas chromatography and spectrophotometry for quinaldine and colorimetry for MS-222. Ten species (coho salmon, brown trout, rainbow trout, lake trout, brook trout, northern pike, channel catifish, largemouth bass, bluegills and walleye) were exposed to quinaldine sulfate and MS-222. Temperature of treatment ranged from 7 to 19C and exposure times ranged from 5.5 to 30 minutes. A wide range of concentrations was necessary, because of the variety of species and temperatures into lyed. The residues of quinaldine and MS-222 in the species tested varied considerably depending on concentration of the anesthetic, temperature, and length of exposure. As any of these parameters was increased, the residue concentra-

tions at 0-hour withdrawal increased. The residue concentrations of quinaldine decreased to less than 0.01 microgram/g and those of MS-222 decreased to near the range of the background of the controls after 24 hours of withdrawal. MS-222 absorbed more readily from the mixed anesthetic solutions, than quinaldine. (Jones-Wisconsin) W75-00564

GROWTH PRODUCTION, AND COMMUNITY COMPOSITION OF FISHES INHABITING A FIRST-, SECOND-, AND THIRD-ORDER STREAM OF EASTERN KENTUCKY, Delaware Univ., Newark. Dept. of Biological Sciences. For primary bibliographic entry see Field 21.

EFFECTS OF HANDLING ON OXYGEN REQUIREMENTS OF AMERICAN SHAD (ALOSA SAPIDISSIMA), Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences. For primary bibliographic entry see Field 5C. W75-00787

AQUARIUM STUDIES ON THE CONSUMPTION OF SMALL ANIMALS BY O-GROUP GRASS CARP, CTENOPHARYNGODON IDEL-LA (VAL.),
Marine Dept., Rotorua (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 2I.
W75-01058

AGE AND GROWTH OF LARGEMOUTH BASS IN CALIFORNIA FARM PONDS, Soil Conservation Service, Sacramento, Calif. R. F. Schultze, and C. D. Vanicek. Calif Fish Game. Vol 60, No 2, p 94-96. 1974. Identifiers: Age, *California, Farm ponds, Fork, *Growth rates, *Largemouth bass, Length, Micropterus-salmoides, Scale, Fish hatcheries.

Largemouth bass Micropterus salmoides growth rate was studied in 3 farm ponds located in the foothills of the central Sierra Nevada. Size of ponds varied from 0.8-14.5 ha. Statistics are given on fork length and scale radius.--Copyright 1974, Biological Abstracts, Inc. W75-01062

EFFECT OF HIGH-CAROTINE SUPPLEMENTARY VEGETABLE FEED ON THE VITAMIN A CONTENT OF RAINBOW TROUT FRY (SALMO GAIRDNERI RICH.), (IN GERMAN), Institut fuer Binnenfischerei, Berlin (East Germany).
W. Steffens, and H. Karst.

W. Steffens, and H. Karst. Arch Tierernaehr, Vol 22, No 6, p 439-444, 1972. English summary.

Descriptors: *Rainbow trout, *Fish diets, *Vitamins.
Identifiers: Vitamin A, Carotine.

To determine whether rainbow trout (S. Gairdneri) is able to convert carotine into vitamin A, trout frow was fed raw beef supplemented with 10% carrots for about 2 mo. In a control pond the fish were fed raw beef alone. After 10 wk of experiment, the vitamine A1 and A2 content of the treated fish was almost twice as high as that of the controls; 3 mo. after the end of carotine supplementation any differences between the groups had disappeared. In both groups, the percentage of vitamin A2 in the total vitamin A content increased continuously and in the same order over the entire growth period. No differences between the groups were found in the content of water, crude fat, crude protein and crude ash.—Copyright 1974, Biological Abstracts, Inc.

OBSERVATION ON THE GROWTH OF HYBRID FINGERLINGS OF TILAPIA CROSSES.
T. AUREA MALE X T. VOLCANI FEMALE,
Agricultural Research Organization, Dor (Israel).
Fish and Aquaculture Station.
A. Yashouv, and A. Halevy.
Bamidgeh, Vol 25, No 3, p 85-88, 1973, Illus.
Identifiers: Cyprinus-carpio, Fertilizers, Fingerlings, Mugil-capito, Ponds, *Tilapia, Tilapia-aurea, Tilapia-volcani, *Growth rates, *Hybrids(Fish), Fish management.

A single pond of 0.1 ha was stocked with 4000 hybrids of Tilapia aurea males X T. volcani females (1 g each). In addition, the pond was stocked with 184 Mugil Capito (2 g each), 4-100 gm Cyprinus carpio and 4-2500 g grass carp. After 230 days of culture 673 kg of Tilapia were recovered, in addition to the other species of fish that had been introduced. The culture pond was well supplied with fertilizers, chicken manure and food pellets. The results indicate the great potential of growth in these hybrid Tilapia.—Copyright 1974, Biological Abstracts, Inc.

A HATCHERY FOR BREEDING AND FORCED SPAWNING AT KIBBUTZ EIN HAMIFRATZ, D. Mires.

Bamidgeh, Vol 25, No 3, p 72-84, 1973, Illus. Identifiers: *Breeding(Fish), *Israel, *Spawning, Storage, *Tilapia, Winter, *Fish hatcheries.

A special hatchery for breeding and forced spawning of Tilapia was set up at Kibbutz Ein Hamifratz, Israel. The purpose of this hatchery was to solve several complex problems in Tilapia culture. The basic problems to be solved were: the need to maintain a reserve stock of spawners of pure species lines, a requirement for producing hybrids with a high percent of males; production of large spawning stocks from aquarium spawnings for commercial purposes and provision of winter storage for the spawning stock. The construction and facilities of the hatchery are described and illustrated in detail.—Copyright 1974, Biological Abstracts, Inc. W75-01086

NEW PROSPECTS IN FISHCULTURE IN ISRAEL, Ministry of Agriculture, Nir Dawid (Israel). Fisheries Dept.

Bamidgeh, Vol 25, No 3, p 67-71, 1973. Identifiers: Fish, *Israel, Ponds, Fish hatcheries, *Fish management, *Fish culture.

The demand for pond fishes in Israel exceeds the supply. In a country where the amount of fresh water available for fish culture is limited there cannot be any further expansion of the area of existing fish ponds. Means of developing intensive methods of fish culture on the presently available area are outlined.--Copyright 1974, Biological Abstracts, Inc. W75-01087

THE OPTIMAL FISHERY PONDS OVER-GROWTH IN THE DON SPAWNING AND NURSERY FARMS, (IN RUSSIAN), Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozvajstva. Rostov-na-Donu (USSR).

nogo Khozyaistva, Rostov-na-Donu (USSR). L. E. Tevyashova, and O. E. Tevyashova. Glirobiol Zh, Vol 9, No 6, p 45-50, 1973. English summary.

Identifiers: Nursery, Optimal development plans, Ponds, Primary production, Soils, Spawning, USSR, Vegetation, Fish hatcheries, Fish management.

Curvillinear dependence between fishery ponds growth rate and zooplankton development is established. The optimal growth rate for the Don spawning and nursery farms (Russian SFSR,

USSR) is associated with a primary production value of about 20 tons/ha for zander and 25-45 value of about 20 tons/na for Zander and 25-45 tons/ha for bream. When the littoral vegetation development exceeds the optimal values, soil-improving control measures are necessary.--Copyright 1974, Biological Abstracts, Inc. W75-01088

POND AND CAGE CULTURE OF CHANNEL CATFISH IN VIRGINIA, Virginia Polytechnic Inst. and State Univ.,

Blacksburg.
D. W. Holmes, V. M. Douglass, and R. T. Lackey.
J Tenn Acad Sci, Vol 49, No 2, p 74-78, 1974, Illus.

English summary. Identifiers: *Channel catfish, *Growth rates, Ictalurus-punctatus, Nutrition, Oxygen, Ponds, *Virginia, *Cage culture(Fish).

Experimental pond and cage culture of channel catfish (Ictalurus punctatus) (1970 and 1971) were used to predict if marketable-size (greater than 340 g) fish could be successfully grown in existing south-central and western Virginia ponds in I growing season. Results from pond culture experiments indicate that marketable-size channel catfish can be raised in I growing season if the initial stocking size is at least 150 mm. Cage culture showed promise as a catfish rearing method, but several problems were encountered. Most fish did not reach marketable size in 1 growing season several problems were encountered. Most fish did not reach marketable size in 1 growing season partly because they were less than 150 mm when stocked. The lack of a nutritionally-complete feed hindered growth in 1970, but this problem appeared to be solved in the 1971 growing season with the use of Purina Cage Catfish Chow. Low dissolved O2 and poor quality cages were other problems. Although this work is experimental, it is probable that marketable-size catfish can be grown in the piedmont region of Virginia using cages.—Copyright 1974, Biological Abstracts, Inc. W75-01089

THE CONSERVATION OF FRESHWATER FISHES IN THE BRITISH ISLES,
Institute of Terrestrial Ecology, Edinburgh P. S. Maitland.

Biol Conserv, Vol 6, No 1, p 7-14, 1974, English

summary. Identifiers: *Fishery conservation, Pollution, Land use, *Fish hatcheries, *United Kingdom.

The status and distribution of populations of freshwater fishes in the British Isles and their worth as a resource are reviewed. The total value of freshwater fishes to the community is far greater than is normally appreciated and includes, in addition to the economic sport and commercial fisheries, amenity, recreational, educational and scientific, aspects as well as a potentially useful store of genetic material for the future. The main human pressures on existing fish stocks are discussed under the headings of fisheries, pollution and land-use. The principal trends in the British Isles are away from natural and stable mixed fish populaaway from natural and stable mixed fish popula-tions towards artificially maintained, unstable stocks of a few species of sporting or commercial value. In particular the rarer, more sensitive, fish stocks with poor powers of distribution are being and replaced by commoner, more robust forms with greater powers of distribution. The rarer spe-cies and genetic strains can only survive if con-structive conservation projects are initiated ex-peditiously at a variety of levels.—Copyright 1974, Biological Abstracts, Inc. W75-01092

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

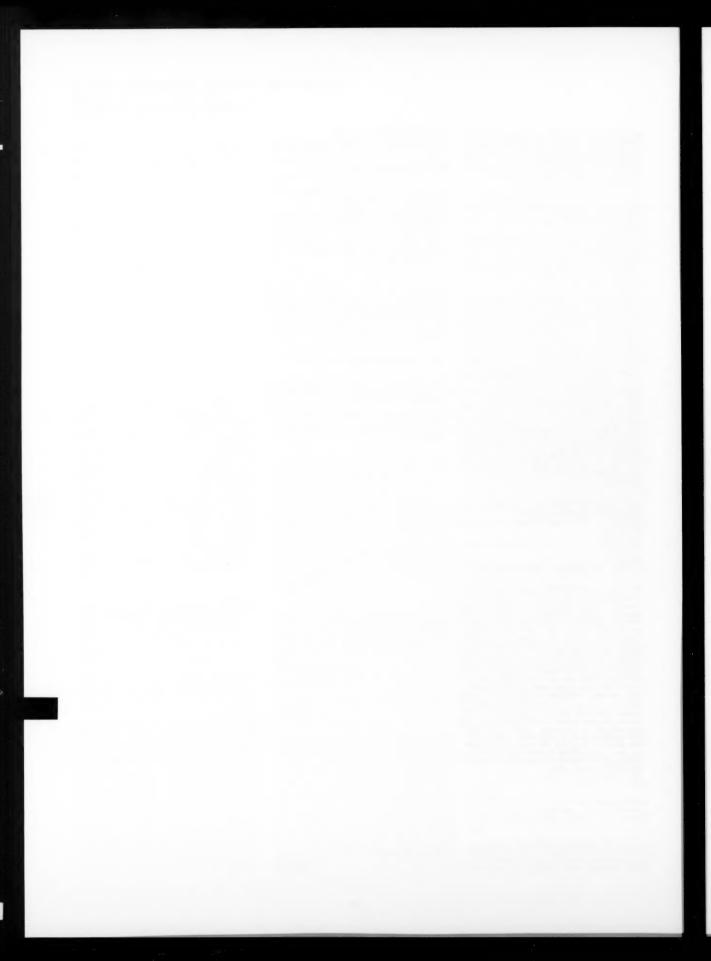
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C. Other		
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Ocean Engineering Information Service (Patents)	W75-01031 01046 01049 01050	18
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
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- Water well construction technology at the National Water Well Association.
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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

NATURE OF WATER

WATER CYCLE

WATER SUPPLY AUGMENTATION AND CONSERVATION

WATER QUANTITY MANAGEMENT AND CONTROL

WATER QUALITY MANAGEMENT AND PROTECTION

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